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# PHOTOGRAPHIC PRIMERS.

*No. I.*

# NEGATIVE MAKING.

BY

*Capt. W. de W. ABNEY, R.E., F.R.S.*

LONDON:
PIPER & CARTER, 5, FURNIVAL STREET, HOLBORN, E.C.

1887.

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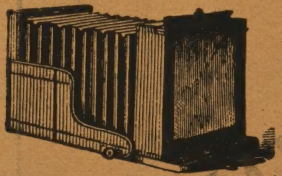

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| 10 „ 8 | 7 4 0 | 1 0 0 | 2 0 0 | 1 5 0 | 1 1 0 | 1 8 0 | 1 12 0 | 2 0 0 |
| 10 „ 10 | 7 14 0 | 1 0 0 | 2 0 0 | 1 5 0 | 1 1 0 | 1 10 0 | 1 14 0 | 2 5 0 |
| 12 „ 10 | 8 8 0 | 1 5 0 | 2 10 0 | 1 10 0 | 1 7 0 | 1 12 0 | 2 0 0 | 3 0 0 |
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| 15 „ 12 | 10 10 0 | 1 10 0 | 3 0 0 | 2 0 0 | 1 17 6 | 2 5 0 | 2 15 0 | 4 10 0 |
| 15 „ 15 | 12 0 0 | 1 10 0 | 3 0 0 | 2 0 0 | 1 17 6 | 2 10 0 | 3 0 0 | 5 10 0 |
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# PHOTOGRAPHIC PRIMERS.

PHOTOGRAPHIC PRIMERS.

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# NEGATIVE MAKING.

BEING A TREATISE ON THE

## PRACTICAL PRODUCTION OF NEGATIVES.

ON

## GELATINE PLATES.

BY

CAPTAIN W. DE W. ABNEY, R.E., F.R.S.

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LONDON:
PIPER & CARTER, 5, FURNIVAL STREET, HOLBORN, E.C.

1887.

LONDON :
PIPER AND CARTER, PRINTERS, FURNIVAL STREET, HOLBORN, E.C.

# CONTENTS.

# PREFACE.

THE main part of this elementary work was contributed in the shape of articles to the *Boy's Own Paper*. Permission was asked from, and readily granted by, the Editor of that journal, to allow the contributions to be enlarged and published in a separate form. The revision has been carried out by the Author, and the present volume is the first of a series of "Photographic Primers" which it is intended to publish. The contents are entirely devoted to practical advice and manipulation, as it was considered that all theoretical considerations might very well be relegated to more advanced works, such as "Instruction in Photography," by the same Author.

The book does not pretend to be an exhaustive treatise on the subject; but it is believed that if the directions therein contained be followed, the photographer who is serving his novitiate will be able to produce negatives which will be technically good. Continued practice, together with a thoughtful study of composition, will alone enable the photographs to be artistic.

# PHOTOGRAPHIC PRIMERS.

## CHAPTER I.

### INTRODUCTORY.

The first most necessary, and by no means least important, step which has to be taken when commencing photography, is the purchase of a camera, lens, and camera-stand. We have often been asked what camera we should recommend, and the size which a beginner should procure. In this chapter an endeavour will be made to answer these questions. First of all, it is well to enquire what are the special qualities which a camera should possess. It should, of all things, have the negative quality of not being one of those gimcrack things which are more or less in the market at the present day. That is, then, it should be strong, and, if a slight blow from any cause should happen to it, it should not fall to pieces, or the working parts be at once put out of gear. Again, for landscape work, it should be as light as possible consistent with strength, and should be in portable form—that is, it should fold up into as little a compass as possible. Then, again, it should, for convenience, focus from the back, and the movement of the camera body by the rack-and-pinion motion, which alters its length, should be smooth and easy. It should be made of well-seasoned

wood, as otherwise what even an accidental fall might not do, shrinkage will inevitably accomplish—viz., render it liable to fall to pieces or to warp—a by no means uncommon thing in inferior cameras.

So far, then, the requirements of a camera will be readily understood, and we advise that some first-rate maker—there are several in London and other large towns—should be interviewed, and a camera selected having the above requisites. The expense of a camera from one of these makers may be rather greater than if some toyshop contrivance is acquired; but then we fully believe that the apparent saving will be no saving in the end, as a good camera will last, perhaps not a lifetime, but, at all events, a very long time (we have had one in use for fifteen or sixteen years), whilst the durability of the other will be numbered by months, or perhaps weeks. Even as a matter of economy, a camera by a good maker is to be desiderated, for supposing an alteration in size of plate is determined upon, the old camera will fetch in the market a far larger percentage of the original outlay than the cheaper one.

The next question that we have to discuss is the size of the plate which it is desirable to use. The following will show some of the sizes which are in general use:—

$3\frac{1}{4}$ inch by $4\frac{1}{4}$ inch, called a quarter plate.
5 „ by 4 „
$6\frac{1}{2}$ „ by $4\frac{3}{4}$ „ called a half plate.
$7\frac{1}{2}$ „ by 5 „
$8\frac{1}{2}$ „ by $6\frac{1}{2}$ „ called a whole plate.

Beyond these there are other sizes which are used by experienced photographers, but for the beginner certainly

the choice should be amongst the above. For our own part, we should advise that the camera should take a plate of not less than 5 inches by 4; perhaps the size which is most suitable in every respect is the half-plate, $6\frac{1}{2}$ inches by $4\frac{3}{4}$. The quarter-plate is rather too small for effective pictures, whilst the half-plate allows the composition of a really good picture, and in groups gives figures sufficiently large to be recognizable without any trouble.

For carte-de-visite portraits, the annexed figure shows a

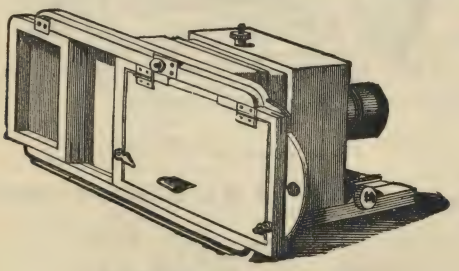

*Fig.* 1.—Carte-de-Visite Camera.

good type of camera. It is not a portable camera, but adapted for use in a room. This will carry a half-plate, and allow two exposures to be given at different parts.

The following engraving (fig. 2) gives an idea of the camera that is recommended for landscape work. It is known as a bellows camera, and weighs only two lb. It is as simple a camera as can be designed. It has every movement which is necessary, and not more, which is a fault often to be seen in many modern cameras where there are more movements, and a derangement in any one of which will often cause the remaining movements to be useless.

Simplicity is what should be aimed at in every camera,

and the diagram (fig. 2) shows one which fulfils this condition. There is one feature in the camera that should be mentioned,

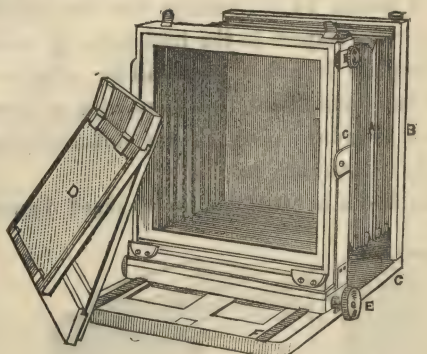


*Fig.* 2.—Camera for Landscape Work.

viz., the "swingback," as it is called; very many cameras

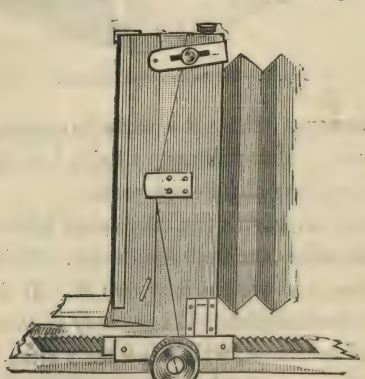

*Fig.* 3.—Swing-Back.

are made without it, but this is a great mistake. An artist, when he draws a house, always makes the vertical lines—

such as the corner lines and the windows—parallel with one another; that is, they have no inclination to meet if they are produced, and the reason for this is that a person looking at such an object is accustomed to see things as they appear when looking straight in front of him, and not up and down. Now it very often happens that in taking a photograph the lens and camera have to be tilted out of the usual level position, and of course when the camera is so tilted the focussing screen is out of the usual vertical position. The consequence of this is, that if a photograph of a house or a church is being taken, the vertical lines of the picture all tend to meet in a point outside the picture, and the photograph will appear distorted; and many of our readers will have seen examples in shop windows. A swing-back corrects this. Whenever the camera is tilted, the swing-back should be made to be in a vertical plane; that is, when a plumb-line is placed against the focussing screen it should lie against it throughout. It can easily be shown that when the swing-back is thus used, the vertical lines in a picture will always be vertical. For this reason every camera should be furnished with a swing-back.

The front board of the camera should be able to be raised at least an inch, carrying with it the lens. The use of this will be seen further on.

The question as to the slides almost settles itself, supposing a series of slides should be used. They are invariably made double—*i. e.*, to carry two plates, back to back, a central partition being between the two, and fastened down over the back of one. They should be light, and at the same time be strong enough to prevent the draw-fronts cracking. The whole of the series should be well blackened inside with

dead black varnish. This is important for two reasons: 1st, it prevents reflections; and 2nd, no thin wood is perfectly opaque, but the black renders it so. The slides should also be numbered. The first slide should bear the numbers 1 and 2, the second 3 and 4, and so on, and the lowest number should always be on the side of the double back, the plate of which will be taken out first. A reversal of these numbers is sometimes awkward.

Sometimes a single slide is preferred, with what is known as a changing-box for carrying the supply of plates. Such a changing box is represented in the accompanying figure.

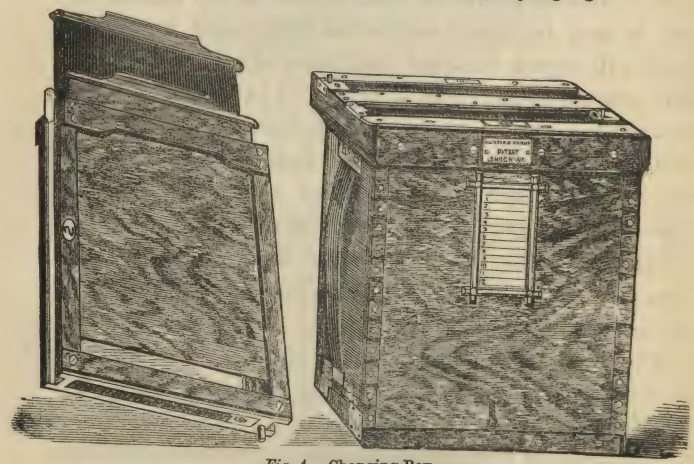

*Fig.* 4.—Changing Box.

The changing-box contains twelve or more grooves, each carrying a plate, and the lid of the box slides so that a slit (covered except when plates are changed) can be brought over each plate. In grooves above this slit the slide is slipped, and when in position the cover of the slit and a corresponding

slit in the slide open. The plate in the slide slips into an empty groove in the box, and the slit is placed over a groove containing an unexposed plate. By turning the box upside down the plate slips into the slide, and on removal of the latter from the box the two slits are automatically closed.

For our own part we have two objections to the use of the changing-box: 1st, plates are rarely cut with sufficient accuracy; and 2nd, there is a liability for dust to settle on the plates, for though the slide and box are light-tight, they are not dust-tight.

For exposing paper in the camera two or three methods may be adopted. When the paper is supplied in long lengths a roller slide is convenient. The following is a description of the Eastman roller slide :—

"The roll-holder consists essentially of a metal frame carrying the spool wound with the supply of paper, and a


*Fig.* 5.—Eastman Roller Slide.

reel for winding up the exposed paper, suitable devices for maintaining a tension upon the paper, and measuring and registering mechanism.

"The frame is hinged at both ends to the panelled board

which forms the back of the enclosing case. Fig. 5 shows the holder with the case partly raised, fig. 6 the movement raised for changing the spool.

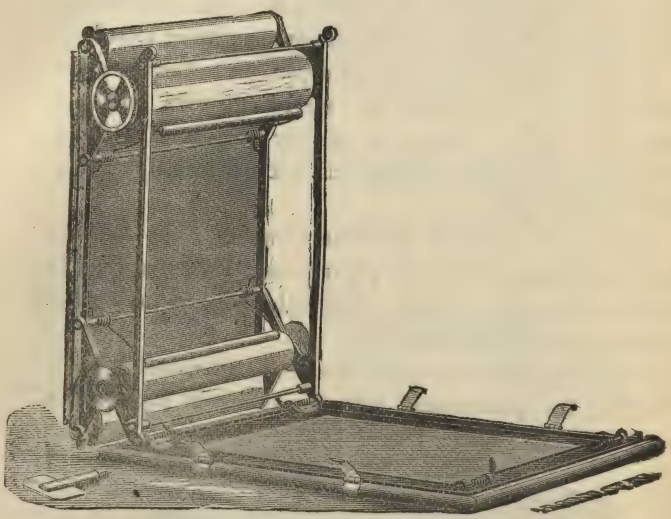

*Fig.* 6.—Eastman's Roller Slide Open.

"To fill the holder, the movement is raised as shown, the spool inserted in its place under the brake, and fastened with the thumb-screw on the side of the frame; the pawl on the tension barrel is thrown off, the band on the spool broken, and sufficient paper drawn out to reach over the bed to the reel; the movement is shut down and fastened, and raised at the reel end; the paper is then drawn over the guide roll and slipped under the clamp on the reel, and the reel turned sufficiently to give the clamp a hold on the paper. The pawl on the tension drum is now thrown in, the tension put

on by turning the tension barrel over to the left until the paper is taut; the movement is shut down, the case put on, the key is inserted, and turned until an alarum strikes once. The slide is drawn, and the limits of the first exposure marked with a lead pencil. The holder is then ready to attach to the camera. After the first exposure, turn the key until the alarum strikes four times (three in the 4 by 5 holder), and this brings a fresh sheet on to the bed for exposure. When the required number of exposures have been made, take the holder into the dark room, take off the case, and insert the point of a pen-knife in the slot in the guide roll, and separate exposed from the unexposed by drawing it along the slot. Throw off the pawl from the reel, and draw out the exposed paper, and cut it off at every fourth mark (third mark in the 4 by 5 holder) with a pair of shears. If any unexposed paper remains on the spool, draw over the end, and attach it to the reel as before, and the holder is ready for work again. The holder should be carefully dusted out before filling."

When paper is supplied of the size of the plate adapted for any particular camera, other artifices may be adopted. Mr. Warnerke has introduced a flat, thin board the size of the plate, on which canvas is glued. This canvas is given a coating of india-rubber and gum, which keeps the surface tacky. The back of the paper is pressed against this, and keeps the surface flat for exposure in the dark slides.

M. Vergara has introduced a special slide for paper, which consists of a frame with a draw-board on each side, and at the bottom is inserted a thin partition, round which a piece of paper of double the length of piece to be exposed is folded. This central partition and the paper are slipped up into the

slide, and the opening at the bottom is closed. The paper is held taut, and each surface can be exposed in the ordinary manner.

Another plan is to coat the rim of thick cards cut to the size of the plate with a coating of gelatine and glycerine, as used for the various "jellygraphs," and to make the edges of the paper adhere to such coating. We have often used cards without this, merely fastening the corners of the paper down by means of small squares of gummed paper about ¼ inch side. When the card is in the slide the edges press against the plates and keep the paper flat. A very convenient plan, though not the most economical, is to get the paper a size larger than the plates, cut it down to the right size at the ends, fold the surplus of the sides over a card the same size as the plate, and press it into the slide. This plan keeps the paper quite taut. We generally use this plan ourselves.

The next piece of apparatus required is a camera-stand or legs. Such should be light and yet firm, for they have to be carried, and to be used under a variety of circumstances which would necessitate the camera shaking unless they are really rigid.

For a camera such as a 6½ inch by 4¾ inch, the accompanying form (fig. 7) is very good. We have carried such abroad on photographic tours, and never spoilt a picture from want of rigidity. The legs, it will be seen, fold into two, and the top, on to which they fit, is furnished with a round flat board to come in contact with the camera. This has two advantages—one, that it prevents the camera from being scratched by the brass top; and the other, that it gives a bigger base for the camera to rest upon. Some makers, instead of using the wooden top to the stand, cover the brass

triangle with thick felt. This is quite sufficient to prevent damaging the camera by scratching. There are several other varieties of legs which slide or fold, but, as a rule, they are heavier than these, which are very light.

There is one advantage in having legs which slide as in fig. 8—viz., that on uneven ground the camera is more easily levelled by shortening or lengthening one or two of

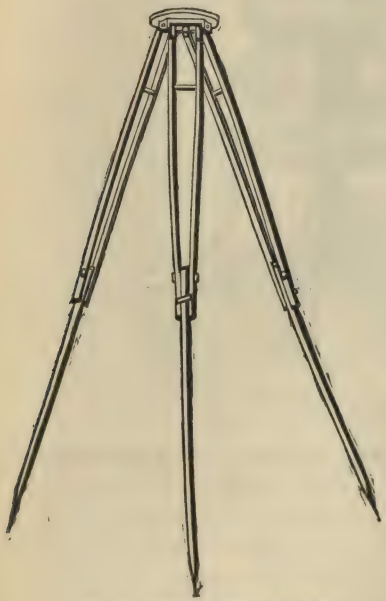

*Fig.* 7.—Folding Camera Legs.

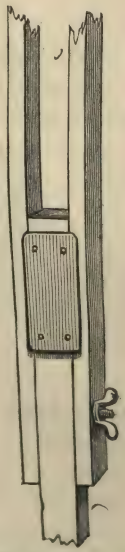

*Fig.* 8.—Sliding Leg.

the legs. By a little practice the legs recommended above can, however, be used on the most uneven ground, such as on the side of a steep mountain.

For portraiture in a room, fig. 9 shows a stand which

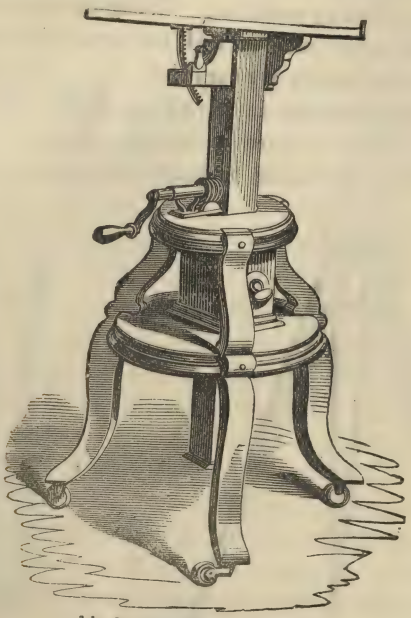

*Fig.* 9.—Studio Camera Stand.

is very rigid and easily moved, and the camera can be raised or lowered.

# CHAPTER II.

## LENSES.

We now come to the part of the apparatus which has to be most scientifically constructed, and that is the lens. It is not to be supposed that our readers can purchase a variety of lenses, so the question resolves itself into which are the most generally useful. In the case of the lenses, as well as of the camera, a little extra money spent is well laid out. A very cheap lens is a mistake; for although sometimes a good one may be obtained at a very low price, yet more often than not such lenses are worthless. What is often called a landscape lens, which is really a single lens compound of two, or even three, lenses cemented together, with an aperture in front, is a very excellent lens to use for landscape work, and for landscape work alone; the reason for this limitation being that single lenses with an aperture in front give what is called barrel-shaped distortion. That is, supposing a square wall is being photographed, the sides being near the margin of the plates, these sides will appear to curve inwards at the top and bottom of the plate, and hence we have distortion. In the diagram the left-hand figure gives the distortion indicated above when photographing the right-hand figure. The middle figure shows the distortion

that would occur if the stop were behind the lens. In a landscape in which no buildings appear at the margins of the plates this distortion does not greatly signify, though, of course,

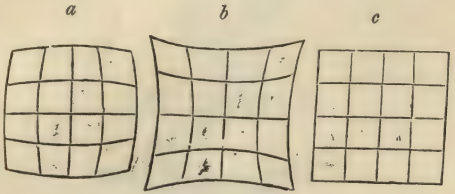


*Fig.* 10.—Diagram of Distortion.

absolute truth in perspective is wanting; and for such subjects there is no better lens to use than what is known as the landscape wide angle of Dallmeyer or Suter. These lenses give very bright images—1st, because there are only two surfaces which reflect light; and, 2nd, because the rays strike these surfaces at nearly right angles. The field is very fairly flat—*i.e.*, a large stop can be used for bringing the whole picture into focus, and the distortion is not excessive. It should be remembered that the closer to the lens the stop is placed, the less distortion there will be. We may say that the landscape photographer, if he possesses such a lens as the above-named, will use it five times out of six in preference to any other. The only other kind of lens we need refer to are the doublet lenses, for landscapes and architectural subjects. As a rule, these lenses are what may be called symmetrical lenses; *i.e.*, there are two lenses, one at each end of the brass mount, which are interchangeable, being exactly similar in every respect. There are a variety of these in the market, but we strongly recommend the rapid rectilinear of Dallmeyer, the rapid symmetrical of Ross, or the

B lens of Suter. Each of these has a distinct market value where it is sold or exchanged, and it is difficult to obtain any one of these second-hand, except at a very slight reduction

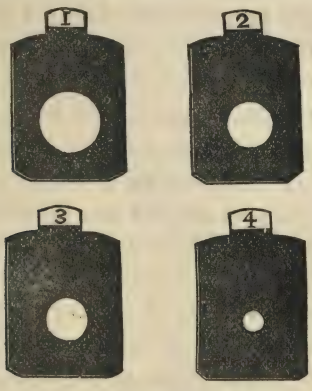


*Fig.* 11.—Diaphragms or Stops.

on the original cost price. These doublet lenses are non-distorting in any sense of the word, and have a fairly flat

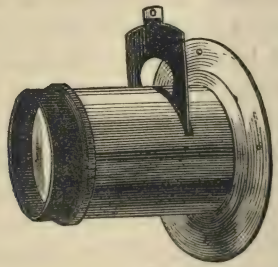

*Fig.* 12.—Doublet Lens.

field—*i.e.*, give good images with a fairly large stop. They can be used for portraiture; indeed, for some purposes, they

have a distinct superiority over the portrait lenses which were so largely used in the days of wet-plate photography. If only one lens can be afforded, the most generally useful lens will be a doublet such as recommended above; if a second can be afforded, then a single landscape lens; and if a third, a "wide-angle rectilinear lens," which embraces a wide field of view.

For our own work we use a wide angle landscape lens, which covers a plate just one size larger than that we use—thus for a 7½ by 5 plate we use a whole plate lens. The angle of view obtained by this lens is sufficiently large to embrace most subjects which are judiciously chosen. As a matter of history, we may mention that in the old days of photography the general run of lenses gave on the focussing screen a much smaller field of view than those of the present day, and as to the artistic choice of subjects, limited as it was by the slow processes for producing negatives, we doubt if much progress has been made since those early days.

A word or two now about stops, which are an important adjunct to every lens. A stop is used to secure sharpness of focus throughout the picture, and the smaller the aperture, the sharper will be the focus. To cover a plate with a sharply defined image, a good lens should require but a comparatively large stop, supposing the view to be a distant one which is being focussed, and the immediate foreground not being considered. An inferior lens will probably require a considerably smaller stop than a good one. We may just remark that a point in any picture appears to be sharp if it is formed of a disc $\frac{1}{100}$ of an inch in diameter. Therefore, in a small-sized image, a proportionally larger stop may be used to obtain this dimension for each point in a picture than on a larger-sized image. For example, if the image of a tree in

the distance measure one inch, and a stop of a certain size just gives the necessary sharpness of focus, then should the same proportionally-sized stop be used for a lens which produces the same object four inches in height, it is manifest that the discs representing points will be four times that size, and will not appear sharp.

Now we have used the word proportionally larger in two or three places, and we must explain what is meant. If the focus of a lens be 10 inches, and the diameter of the stop be $\frac{1}{4}$ inch, the stop which will be proportionally equivalent to this in a lens of 20 inches focus will be $\frac{1}{2}$ an inch, or double. It is the practice with photographers to define the size of the aperture by its ratio to the focal length of the lens. The focal length is the distance of the front of the lens from the focussing screen when the image of a distant object is sharp, in a single landscape lens, and in a doublet lens it is nearly the distance of the aperture used for the stop from the screen. Thus, photographers talk of a picture being taken with $\frac{f}{40}$ or $\frac{f}{16}$, which means that the apertures in the stops have simply $\frac{1}{40}$ or $\frac{1}{16}$ of the focal length of the lens employed. The Photographic Society of Great Britain have recommended standard sizes for stops to be employed, and they are numbered according to the exposure necessary to be given with them. See Table at end of this work.

These are the *squares* of the ratio of the focal length divided by the aperture of the stop. Thus, supposing we have to compare two stops, $\frac{f}{16}$ and $\frac{f}{32}$ together, we shall *not* find that we only require twice the exposure of that necessary when the larger stop is used, but *four times*. As has been stated before, the Society's stops are numbered with proportional *exposures*, which much simplifies their use in the hands

of the photographer. Several of the best lens makers, however, have not, so far, adopted the standard stops, though it is to be hoped they soon may, but designate their stops as No. 1, 2, 3, &c., and sometimes they insert a 2×, or 1×. Their rule is that each number requires double the exposure of the preceding one. Thus No. 2 requires twice the exposure of No 1, and No. 3 twice the exposure of No. 2, and therefore four times that of No 1, and so on. When a number followed by a × is used, it means that the exposure required is half as much again as the same number without ×. Thus, No. 2× would require half as much exposure again as No. 2.

It is unnecessary to enter here more fully into the question of stops, as they will be referred to again in a succeeding chapter, when the practical application of the insertion of a large or small stop is touched upon.

Our readers, then, are supposed to be fitted with a camera, lens, and stand. There is one more article that we must have, and that is a focussing cloth. A couple of thicknesses of black twill, about three feet square, is the most economical cloth, though a piece of india-rubber sheeting is better, as it is a protection for the camera against rain. The use of the cloth, as may be imagined, is to place over the head and camera whilst looking at the image on the focussing screen. If a patch of white light be thrown upon one side of a ground-glass screen, and another smaller patch of white light, only $\frac{1}{100}$ of the brightness, be thrown on the other side, the extra brightness of the smaller patch becomes imperceptible. Now, in very many parts of an image thrown on the focussing screen, the brightness is less than $\frac{1}{100}$ of the brightness of the light outside. Hence, to see the image well, the outside light must be cut off.

## CHAPTER III.

### DRY PLATES AND THE DARK ROOM.

A WORD now as to the dry plates to be employed. There are a great many different brands in the market, all of which must be supposed to be good, since the makers find buyers for them; but there are some better than others, and some which are cheaper than others.

We prepare our own plates, and those suit better than any others. There are plates in the market which are made by the same formula, and we don't think that the tyro in the art will go wrong in selecting these plates, as they are very easy to develop, and are very sensitive. At any rate, care should be taken that the film on the plate is fairly thick, as if thin no latitude in exposure can be given. Whatever plates are selected, however—and probably some friend may recommend plates which he has found answer—it is requisite to get them into the slides without allowing them to see any light which is hurtful to them. The light should be orange light, and not too strong.

It may be that the photographer will not have the benefit of a proper photographic "dark room," which is really a

light room, but one to which orange light alone is admitted. We propose to show how he may convert any room into a "dark room." Suppose the room available to have only one window. The whole of the window should be covered with two thicknesses of brown paper, either carefully tacked on to the frame, or, better still, pasted on. Two thicknesses are necessary, as minute holes are often found in single sheets. A piece equal in size to two panes of glass should then be cut out, and over it be pasted two thicknesses of common orange paper, such as is used for wrappers. The nearer it approaches the tint of the skin of a dark-coloured orange the safer it will be. Some photographers prefer what is known as canary medium. We don't recommend it by itself for a strong light, but one thickness of it with one of orange may be employed. Should the sun shine on the window, a third thickness of orange paper fastened only at the top of the orange window will be necessary. When the sun no longer shines on the window it can be lifted up, and the two thicknesses alone used. Where a window can be re-glazed we recommend what is known as stained red glass or stained orange, as a glazing material, and, on the inside of this, one thickness of orange paper. The light coming through such a colour can have but very little effect on the plates which are in the course of development. The mode of testing the safety of the light admitted into the "dark room" will be found further on. When the door of the room is shut there should *not be a glimmer of white light.* Perhaps light may come through the crevices of the door, or down the chimney even. In such cases a rug hung over the door, and the closing the register of the grate, will keep out the visitor which is ordinarily so acceptable; but who is here most unwelcome.

Another plan of making a dark room is to hang a rug over the whole of the window so as to darken it completely, and then to use a properly shielded candle to enable the operator to see what he is doing. There are cases on record in which plates have been placed in the slides in a bed in an ordinarily lighted bedroom, the photographer taking plates and slides beneath the clothes and excluding light in this way. In such a case the operation is performed by feeling, and is rather risky to the tyro.

However, to return to our now darkened room, a very safe light is obtained by enclosing a candle in an orange screen.

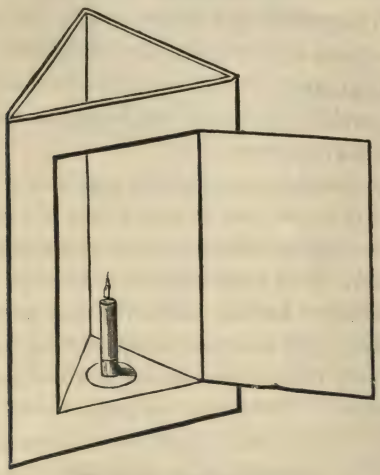

*Fig.* 13.—Dark Room Lantern.

The screen is made as follows, the description being taken from "Instruction in Photography" by the presen writer.

Take a sheet of cardboard of the size of about two feet by

one foot six inches. Lay off from the two feet side distances of eight inches from each corner, and with a penknife cut half through the card in a line parallel to the ends. These will form flaps, which can be folded over to meet in the centre. From the centre portion mark out a rectangle of about six inches by twelve inches; cut round three of the sides, but only half cut through one side, the penknife being applied from inside of screen. This will allow a square flap to open outwards. On the inside of the opening may be pasted or hung a sheet of orange paper, or a sheet of paper dyed deeply with a mixture of aurine and aniline scarlet may be glued to it. The candle is placed behind the screen, which should stand, supported by the two wings, in front of the operator. A piece of board or a piece of tin may rest on the screen, and thus cut off diffused light from the ceiling. When packed for travelling, the flaps are folded up, and it can be placed in the portmanteau.

Sometimes chamber candlesticks will not go inside the screen, and it is a good plan to bore a hole in a block of wood about three inches square and two inches thick, and use it as a candlestick. Tall candlesticks are usually too high to use comfortably, and for this reason the plan suggested above is recommended. We have had made for us a lantern larger than the ordinary railway reading lamp, which packs flat, and is very convenient. The figure on page 23 will show what form it takes. In it either a small colza oil lamp, or a candle can be used. The lantern folds for travelling. The back slides down in the grooves from the bottom; the top and bottom also slide off, and the sides fold about pivots, and close up into the space represented by the front. The front B is glazed with stained orange glass, which also slides in grooves, and

can be replaced. The bottom is perforated with small holes along two lines parallel with the sides, and these are closed by half-cylinders A A, which allow the air to enter for the purposes of combustion. In the top is a hole some 2½ inches in diameter, and beneath it is a tin disc, 3½ inches in diameter, which would close the aperture were it not kept

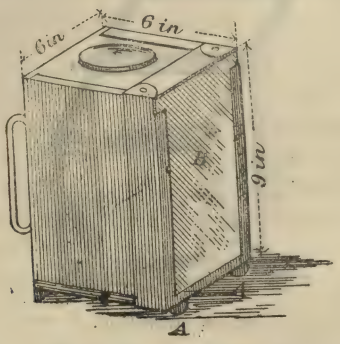


*Fig.* 14.—Dark Room Lantern.

away by three block tin strips, which allows a quarter inch opening all round the disc, and gives an exit for the products of combustion. No part of the lantern is *soldered;* it is all rivetted, so that there is no fear of anything coming to grief by the heat. There are handles behind for carrying the lantern; as before said, this lantern carries an oil light or a candle. The latter should not be more than 4½ inches in height to commence with. We have found that the lantern keeps cooler, and the light is even more agreeable, if the glass be removed and a single thickness of orange paper be fixed against the front. It will be remarked that the same lights may be used at night, but it must be remembered that

even at night care is requisite. Moonlight must be shut out, since the plates are readily affected by it.

We have constructed a small table tent for use in changing and developing plates, which we have found extremely useful. It consists of a framework of wood, which folds flat

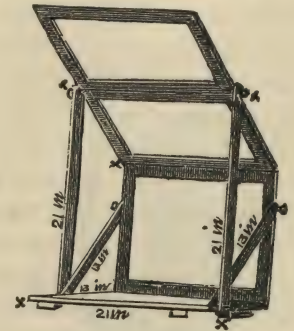


*Fig.* 15.—Table Tent.

against a base-board. It can be made to weigh but three or four pounds, and can be readily packed in the portmanteau or basket used in carrying the camera when on tour. Over this framework slips a cover made of two thicknesses of turkey red calico and one of black. At the front is cut out a window, which is filled with three thicknesses of orange calico, or two of turkey red and one of varnished orange paper. The cover at the back may be made to accurately fit the frame on all sides except the back; there it should be made so loose that the head can go readily under the cover, and the flaps coming from the base, sides, and top should be so long that they can be tucked round the operator when seated behind it. We sometimes tuck ours under the

waistcoat, and then we have a certainty that no light can enter.

The placing of the plates in the slide and removing the exposed plates requires more care than is usually bestowed upon the operation. Prepare small pieces of gummed paper on which consecutive numbers are written, these labels being about a quarter of an inch square. Before placing the plate in a slide, one of these labels is gummed on the back of the plate and at one corner of it. The number of the plate placed in any particular slide is noted in a note-book, and when it is exposed the memoranda regarding the exposure are written opposite the number, so that one can always tell what exposure any plate has had, and the circumstances under which that exposure was given. Let us go through the operation of emptying the exposed plates from the slides and re-filling them. A table about four feet by three feet should be procured if possible, and the lantern placed at the back centre of it, so that there is room to place boxes, slides, &c., in handy positions. Amongst other things, a flat, soft, badger-hair brush should be present to brush the surface of the plates and slides, and thus prevent dust clinging to them. The first slide is opened and the plate is extracted, taking care not to finger the gelatine surface of the plate. Back and front it is dusted by passing the brush lightly over the surfaces, and is placed, *back down*, in the centre of a piece of orange paper. A piece of dry orange paper, also carefully dusted, the size of the plate, is placed upon the gelatine surface, the second plate is extracted, dusted, and placed *gelatine side down* upon it. The next slide is opened, and its first plate placed back down on the back of the second plate; another piece of

orange paper placed on its face, and the second plate placed face down on the orange paper, and so on till all the slides are emptied. If it should happen that there is an odd plate, it is always placed face down on orange paper. When half a dozen plates are thus placed, the large orange paper on which the first plate rested is doubled over and over, so as to form a parcel, and tied up with string to prevent the plates moving and rubbing, and then placed in an empty box.

The slides have now to be filled, but before opening the packet containing the plates, each slide should be dusted, not only the inside, but the grooves. When this is done the slides may be filled. A plate is taken out of the packet, dusted back and front, and examined cautiously by holding it up to the orange light to see if there are any transparent or other spots present; should there be such a defect it must be rejected, or be so placed in the slide that any defect will occupy some unimportant part of the picture. A gummed label (as before said) is placed in the corner of the plate at the back, the number of the slide noted, and both numbers entered in a note-book. Each double back is then filled, and the slides closed. On the following page is a specimen of a page of a note-book.

We have been thus particular in describing the method of filling and emptying the slides, as, above all things, cleanliness in photography goes a great length on the road to success. For paper, the same precautions must be taken.

| Slide. | Number on Plate. | Sensitometer Number. | Date. | Hour. | Lens. | Stop. | Exposure. | Subject. | Light. | Developer. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1886 | | | | Sec. | | | | |
| 1 | 13 | 18 | Aug. 27 | 3.15 | WA | 3 | 3 | Kirkdale Pass. | Sun | | |
| 2 | 14 | ,, | ,, | 3.20 | ,, | 4 | 6 | ,, | ,, | | |
| 3 | 15 | ,, | ,, | 4.0 | RR | 4 | 10 | Cottage near Kirkdale. | ,, | | |
| 4 | 16 | ,, | | | | | | | | | |
| 5 | 17 | | | | | | | | | | |
| 6 | 18 | ,, | | | | | | | | | |
| 1 | 19 | 20 | | | | | | | | | |
| 2 | 20 | 21 | | | | | | | | | |
| 3 | 21 | ,, | | | | | | | | | |

# CHAPTER IV.

## EXPOSING THE PLATE.

THERE is nothing so pleasant as some fine morning in spring or summer to trudge along some country road, camera over the back, and more particularly in company with some kindred spirit, in search of some pretty bits to photograph. The wayside pond, for instance, with its usual concomitants of weed and cart tracks, will often furnish a delightful subject for the camera; or, again, a shady lane, with play of light and shade over an otherwise unphotographic road, may give a picture.

There is, in fact, scarcely a road along which some bit may not be selected; but in order to choose effectually, much practice is generally requisite. A walk should never be taken without noticing what will make a view, and at what hour it will probably be best lighted, and then, if practicable, that hour should be selected on some suitable day, and the picture, previously selected, be impressed upon the photographic plate. Don't let our readers think that Swiss, Scotch, or Welsh scenery is necessary to make a pleasing picture; it is the "bit" which is often the most effective in photography.

One grand rule to remember is, that *as a rule* every photograph should possess a decent foreground. Objects which are near the camera, say twenty feet from it, help to give an idea of the size of the more distant ones, and for that reason some near objects, but selected so as not to overpower the rest, should almost invariably form part of the picture. Then the foreground should be broken up as far as possible, and not be one smooth and evenly lighted mass, as is, for instance, a white road unbroken by the shadows of trees coming across it, or by some waggon or figures judiciously placed. In regard to these last, never place your figures to look too large, unless you are making a picture of the figures themselves.

Even if practicable, it would be out of place here to enter into details of how exactly to choose a picture. A reference should be made to the work of Mr. H. P. Robinson as to the mode of proceeding.* We may say, however, that when the educated eye is pleased with the *whole* of the view seen on the focussing screen, the photograph will probably be fairly artistic. The great point to remember, however, is, that the delicious effects of colour have to be translated into monochrome, and until the photographer is able to do this mentally, his pictures may lack something in chiaroscuro. An aid to forming a judgment is to look at the view through a piece of cobalt blue glass. This will give him nearly a monochrome in blue, and will not be of very different value to the photographic monochrome. We hear of the folly of people looking through blue spectacles at mundane affairs, but here is a case in which such a procedure is really useful. Now suppose

* Pictorial Effect in Photography.

such a view has been chosen; we wish to show how the plain, practical part of the work should be carried out. We will suppose the camera to be on its legs and ready for work, and that the lens is pointing to the view to be taken. The dark cloth—to which, by the bye, it is all the better to have a large loop attached to put over the lens—is placed over the camera and over the head, and the picture is seen upside-down on the focussing screen, the reason for which it is hardly opportune to enter into. The rack of the camera is moved (the lens being without a stop) till some part of the picture appears sharp, or "in focus." A stop of medium opening is then inserted, and the image made as sharp as possible.

It will usually happen that a medium stop still allows some part to appear "out of focus." If it does, then keep inserting smaller and smaller stops till a sharp focus all over the screen is obtained. It is better to use too small a stop than too large a one. The unnecessarily small stop makes the picture unnecessarily sharp, but that is a good fault—if a fault can be good. The next point to attend to is to form a judgment as to the necessary exposure. One golden rule to remember is, not to give too brief an exposure, particularly when near trees form part of the picture, as there are always some very deep shadows in them which are very slow in impressing the photographic plate.

With a good gelatine plate, and on a fine day, with the smallest stop usually supplied with most lenses, if the view be not shut in by trees, two to five seconds may be given. The plate would probably do with less, but the evil effect of a too prolonged exposure can be mitigated in developing the plate, as will be shown hereafter. Anyhow, a judgment must be formed as to the length of exposure required, and

that should be acted upon, erring, if anything, on the side of over-exposure. The slide is carefully inserted in the camera, the surface of the plate in all well-made cameras being absolutely in the same plane as the ground surface of the focussing screen, the picture is brought to a focus on the plate itself when the front of the slide is withdrawn, and the lens is uncovered. Next see that the slide is secured against moving out of its grooves when its front is withdrawn. There is usually a catch placed on one side of the camera, which prevents its moving. The cap is next placed on the lens, and the focussing cloth wrapped round the whole of the camera, except, of course, the lens. The front of the slide is drawn out by one hand placed beneath the cloth, the other hand steadying the camera whilst the pull is taking place. Now as to taking off the cap, there is something to be said. As a rule, the cap fits rather tightly to the lens, and if caution is not observed, the act of removing it will set the camera in sufficient vibration to prevent a really sharp picture being secured. We ourselves always remove the cap at first only so far that its rim touches the edge of the front of the lens. It can then be removed entirely without the slightest shake.

When the photographer sees that his picture is at rest, and no part of it moving, the cap is taken off, and, after the judged exposure has been given, it is replaced, and the slide closed in the same careful manner. By-the-bye, it should be recollected that the dark slide should always be screened from direct sunlight, or even any strong light, when carried from the slide-box to the camera, or *vice versa*. The focussing cloth is usually thrown over it whilst carrying it to and fro.

In taking an architectural view, or an interior of a room,

besides choosing a pleasing point, there are certain precautions to be taken in placing the camera, which are not so essential in the ordinary landscape work which we have alluded to above. First and foremost, the swing-back of the camera, as we have said in a previous chapter, should be vertical, so that the vertical lines in the picture may not converge.

As a rule, in architectural subjects, if the camera be used quite level, it will be found that, say, the top of a house will be excluded, while there will be too much foreground. In order to include, say, the housetop, and to cut off part of the unnecessary foreground, there are two movements in the camera which can be brought into play. First, the lens may be raised, since our ideal camera has a rising front, and that will raise the picture on the focussing screen. If what is necessary is included by this adjustment, nothing further is required; but should it not be so, the camera must be tilted as well, so that the highest parts of the building which it may be wished to secure will be included. It is here that the swing-back is such a useful adjunct, for the moment the camera is tilted, at the same time the vertical lines of the picture converge. All that is necessary to cure this defect is to make the swing-back absolutely plumb. The vertical lines of the building will then remain parallel, and not show what is to a trained eye an excruciating distortion. It must, however, be remembered that a *smaller stop will have to be employed in such a case to secure an equable focus*, since the ground-glass screen is moved out of its proper plane. It should be strongly impressed upon the tyro that the use of the swing-back in a case such as described must never be forgotten.

As regards taking portraits, something must be said. A great deal may be done in any ordinary and well-lighted room. It does not follow, however, because a room may be well lighted, that therefore it is *properly* lighted. There is a great distinction between the two. If anyone wishes to try an experiment, let him place a sitter near a window, and try to take a pleasing portrait. In ninety-nine cases out of a hundred the resulting picture will be most unsatisfactory, showing large patches of light on the part of the face on which the light shone, and almost absolute blackness on the other parts. A little thought will show *why* this is the case.

A room, as a rule, is seldom lighted so that you can see much close in front of you when sitting with your back to the light. The walls and furniture do not reflect much light, and so do not illumine the objects which the back shades from the light. No doubt all our readers have had their portraits taken in some studio, and will have noticed that not only is a proper background arranged, but also that the photographer places light-coloured screens in such a way as to reflect some light on the shadow side of the face. A hint should be taken from this, and for drawing room portraiture screens should be brought into requisition. One of the most simple is a clothes-horse on which is hung a sheet, which, being white, reflects the white light from the window. The direct light which lightens the face will always be brighter than that reflected from the white sheet. This last should be so placed as to lighten up the dark side of the face or head. If the camera be placed exactly in front of the window, and the face be fully illuminated by the light coming on to it, even if the sheet be used, a pleasing portrait will not

follow. If, however, the arrangement be somewhat as shown in the sketch, a good result can be obtained.

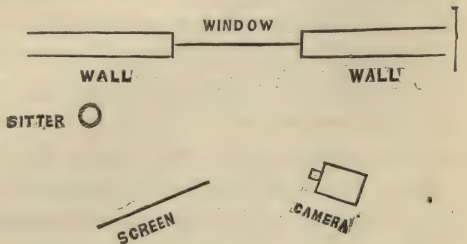


*Fig.* 16.—Arrangement of Room.

It often happens that in portraits taken in a room the shadows under the eyes and nostrils are too black. This defect can be rectified by placing a large sheet of white cardboard on the floor, tilted at an angle by means of a stool, so

*Fig.* 17.—Head-Rest.

as to reflect light upwards. By this means those heavy shadows are lightened, and a more natural look given in the

photograph when printed. In portraiture a golden rule to remember is to give plenty of exposure. In photographic studios it is the custom to place the head of the sitter in a head-rest, which prevents, to a certain extent, the movement of the head during the exposure. A head-rest is a piece of apparatus which, though useful, we can scarcely suppose a beginner will have at hand; and in such a case an arm-chair, or a high-backed chair, may be brought into requisition, and the head be thus supported. Make each picture have some motive; do not let the patient (for patient he or she will be who sits to a novice hand in photography) simply stare into the camera; let him or her be supposed to be doing something, or looking at something else than the camera.

Now as for a background to the picture, it will hardly be necessary in most cases to have a set background; but a grey shawl, if spread over a clothes-horse, and placed behind the sitter, but sufficiently far away from him to be slightly out of focus, will answer. As a rule, however, the room itself will be sufficient background, all objectionably obtrusive and glittering objects being removed from behind the chair. The room, as a rule, will be dark compared to the well-lighted figure, and will be sufficient to make it stand out.

In focussing a portrait, the stop used may be *much larger* than for a landscape; in fact, very often such a lens as the doublets recommended *may be used without any stop at all.* Focus the eyes well, and see that the back of the head is fairly defined; and when this is accomplished the use of a smaller stop will be hurtful.

A portrait or group taken out of doors is a very usual

piece of art which the tyro aims at. Let me say that the former is most difficult, and is *rarely* a success. A group is often taken, but no one expects it to be very artistic, though by skilfully choosing a spot, such as a rustic stile or gate, it is quite possible to do away with that stiffness which is usually the characteristic of the ordinary group. Let every member of the group be doing something, and don't let the party be got up in their "best bibs and tuckers." We must again refer our readers to Robinson's works* on such matters. However, it may be said that a group pleases most people, and if the faces of the members of it can be well recognised, most are content with it. For an outdoor portrait, an endeavour should be made to utilise the re-entering angle between the walls of a house, so that the light principally falls on one side of the sitter, and is reflected from the wall on the other side. We can only give a hint as to this, because the conditions of a house vary so much. In this, as in every other photographic work, remember to give sufficient exposure.

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"Pictorial Effect in Photography;" "Picture Making by Photography;" "The Studio, and what to do in it;" &c., &c. Piper and Carter, 5, Furnival Street, London, E.C.

# CHAPTER V.

## INSTANTANEOUS EXPOSURES.

There is yet another class of pictures to which reference should be made—viz., those which are obtained by what is called instantaneous exposures. It must be recollected that the word "instantaneous" is merely a *façon de parler*. It means an exceedingly rapid exposure, usually varying between $\frac{1}{250}$ and $\frac{1}{5}$ of a second, though, in some cases, as small an exposure as $\frac{1}{2000}$ of a second has been given. Of course, for moving figures or boats sailing, and such like objects, a very rapid exposure is necessary if sharpness is a desideratum. With the former, we may safely affrm that, when the exposure given to a plate is very rapid, no one ever saw figures in the positions in which they are delineated. So with trotting or galloping horses; no one ever saw their legs occupy the apparently absurd positions in which the photograph often shows them. There is one thing which a picture true to nature should always endeavour to attain—viz., to delineate what the eye really sees. The eye can only isolate impressions which do not succeed one another too rapidly. Thus, when a sling is twisted round and round quickly, or when the wheel of a carriage is revolving rapidly, it is impossible to

distinguish the form of the string in the one case, or the spokes of the wheel in the other; and, if an artist were drawing what he saw, he would draw the string and the wheel as a light-shaded circle. Neither the form of the string nor of the spokes of the wheel would be delineated, for, if he did, he would not be drawing what he saw. For the same reason, he would never draw pictures of horses in motion as represented by instantaneous photographs. So, again, in a picture of a breaking wave, when the gleam of the sun strikes on the crests. To the eye, these glimmers will appear as streaks of brilliant light, whilst a photograph will represent them as brilliant dots. It is the fact that the very rapid moving points in the wave-crests which catch the light cause the eye to combine the sensations, and give the idea of a mass of light instead of minute spots. Of course, instantaneous photographs have their uses; and though they rarely are truthful expressions of nature as we see it, we have to make the best of them. That being granted, then, the question arises, how best to take them.

There are a variety of what are known as instantaneous shutters in the market, and many of these are very excellent; but they nearly all have one fault—viz., a tendency to shake the camera during action. We don't say that they *always* do so, but they very often do, and in fact must, as usually arranged, though the shake may be imperceptible, except on close inspection. It will be the more perceptible the more rickety the camera legs are. The shake is due to the fact that they are, with few exceptions, attached to the camera. It is well-known that a sudden alteration in the position of the centre of gravity of a body makes the body tend to move, and, in a shutter at the moment of exposure, the centre of

gravity of the camera is shifted, and hence the shake. This more particularly applies to the shutters which are placed outside the lens. The simplest shutter that can be placed outside the lens is the drop shutter, and such a one is about the cheapest form, and can be made to give any exposure required. The figure will give an idea as to its construction.

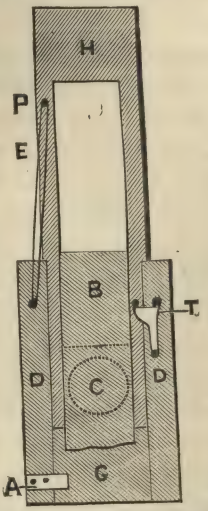


*Fig.* 18.—Instantaneous Shutter.

The writer has seen many home-made ones of this description which have answered as well as the most highly finished. The shutter consists of a back (G), in which a round orifice (C), slightly larger than the front of the lens, is cut; and on its sides and at the front are two projecting grooves, in which a flat piece of thin board (H) can run freely. In this last is cut out a rectangle longer than the breadth of the orifice cut in the back, and is so arranged that, when it is placed at the

top of the back, the circular orifice is closed, and, as it slides down, the orifice is uncovered to the light, and finally it closes it up again.

By placing a trigger (T) and catches (as shown in the figure), the front can be caused to descend by its own weight when its length is placed vertically, and the light can penetrate the two openings for some small fraction of a second. The slide (H) is stopped by the pin (P) coming against a piece of brass (A). The amount of opening that is given in H is regulated by a slide-piece (B) sliding in grooves cut in H. The speed can be increased by using an elastic band (E), passed over a pin (P) at the top of the slide, and attached to another pin fixed outside one of the grooves, as shown. Behind the orifice is glued a thicker piece of wood with a circular opening cut in it, which fits fairly tightly when placed over the front brass of the lens, and it is all the better if it be lined with velvet, to enable it to be placed on the latter without any friction. Attached to this, again, is a velvet bag, which can be tied round the lens. The view to be taken is focussed, and the shutter put in position on the lens. The dark slide is then opened, and the shutter removed from the collar and held in the hand, so that it does not touch the lens except by the velvet bag. At the moment when exposure is required, the trigger is released and the shutter falls, and there is no jar on the camera, since the only connection the two have is the soft velvet of the bag encircling the lens. If the camera and camera-stand be very rigid, other shutters may be used which are attached to the lens. Cadett's shutter, which works behind the lens, and which is attached to the camera itself, is a form to which there is very little objection. It is what is known as a flap shutter, and the flap

consists of a thin wire bent into a circle covered with velvet, which, by a pneumatic arrangement, opens downwards on a hinge, and recovers its position by a spring when the hand releases the ball which presses the air into the bellows and causes the shutter to open. This shutter will give one-fifth of a second's exposure—an exposure sufficiently rapid for most subjects.

There are very many shutters which are attached to the lens; some are clumsy, and others are too heavy. A very good sample of a shutter, however, is Guerry's, of which fig. 19 is a representation. The exposure with it can be

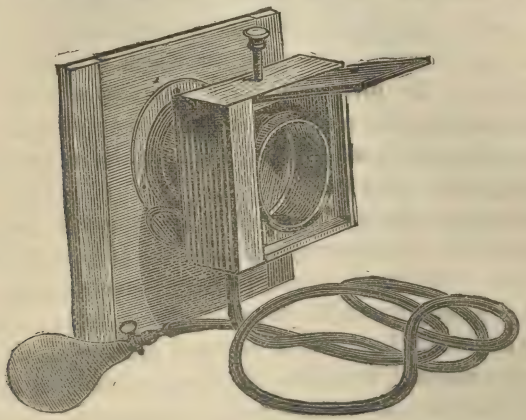

*Fig.* 19.—Shutter.

regulated at pleasure. It is also constructed with two flaps, which increases its efficiency. The latter will give an exposure of $\frac{1}{60}$ af a second when the aperture is $1\frac{1}{2}$ inches.

When an instantaneous view is to be taken, there are one or two points to be attended to. A very rapid plate should

be chosen, if possible, and it may be well to indicate how the comparative speeds of different brands may be arrived at. We will suppose that the reader has a good negative, and a fairly steadily-burning candle at command. To test plates together, he should place a plate behind a negative, and in contact with it, in a printing-frame in the dark room, and cover it up with a cloth, and then bring in the candle and place it about ten feet away from the frame. He should then turn the negative towards the candle, and uncover it for, say, five seconds, and develop. A plate of another brand he should treat in the same way, and, after development, he should see which positive picture appears most rich in detail and density. It is quite possible that one may show much better qualities than the other, in which case the former should have the preference for instantaneous work. By always keeping the same negative to test by, and using the candle at the same distance, the qualities of any plates may be judged at any time.

There is an instrument called a sensitometer (designed by Warnerke), which is very useful for the purpose of testing rapidities. The figure on page 43 will give an idea of it. There is a deep frame (B), in which fits a table (A), consisting of glass with squares of coloured gelatine attached to it, having different opacities. A sensitive plate is placed behind this tablet, and then a back to the frame. In front of the frame is an opening (C), which can be closed by a slide (D), and, in front of that, a phosphorescent glass formed by a coating of Balmain's paint. To use it, the plate to be tried is closed in the frame; an inch of magnesium wire is burnt to illumine the phosphorescent plate (E), which is immediately placed in front of the frame in its groove.

Exactly after a minute has elapsed from the finish of the burning of the magnesium wire, the slide (D) is withdrawn,

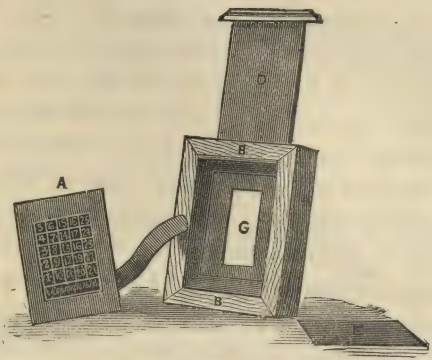


*Fig.* 20.—Sensitometer.

and the phosphorescent light is allowed access to the sensitive plate through the tablet (A) for exactly half a minute. The slide is then closed, and the plate taken out and developed. The last readable number on the plate gives the sensitiveness of the plate, according to a table attached to the instrument (see Appendix).

If tissue-paper be dyed uniformly with a dilute solution of aurine dye (which is a cheap dye obtainable through any chemist), or with turmeric, a very good sensitometer may be made at home by even the least dexterous hands; and, instead of the phosphorescent plate being used as a source of illumination, a candle may be brought into requisition to give an illumination for a certain number of seconds. One of the great charms of photography lies in the fact that so much may be done to help good work by simple arrangements which can be made at home.

Having selected the plate to be used, the next question is as to the stop that can be used in the lens. This is of vital importance if the resulting negative is to be of any use. Now if, with the largest stop of the lens (except when they are furnished with the Photographic Society's standard), one second's exposure is required for any view, with the next smallest two seconds will be required, and with the third four seconds, and so on; so that if there are five stops numbered consecutively, the smallest stop will require sixteen times more exposure than the largest. (The reader should note our remarks about the stops marked with × in a former chapter.) Suppose, then, that the view with the smallest stop inserted in the lens requires one second's exposure, it is evident that, to obtain the same view in $\frac{1}{8}$ of a second, the second largest must be used, since with it only $\frac{1}{8}$ of the exposure will be required. The use of such a large stop will probably cause parts of the picture to be fuzzy or in bad focus; but that is better than having an under-exposed plate. It may be taken as a rule that, in bright light, with a fairly rapid plate and an open view, that for $\frac{1}{10}$ of a second's exposure the third largest stop ($\frac{f}{16}$) may be used, if the development be carried out with care; but it is safer to use the second largest stop.

# CHAPTER VI.

## DEVELOPMENT OF THE PLATE.

We now come to the development of the plates, which we have supposed to be exposed. The "dark room," which is necessary to use for changing the plates, has already been described, and the same light must be used for developing purposes. For the sake of cleanliness it is advisable to cover the table with india-rubber sheeting, or American cloth by preference; or if neither of these be at hand, a couple of thicknesses of newspaper should be spread over it, so as to avoid any risk of stains to the wood beneath. Further, it is well to place the table on sheets of brown paper or oilcloth, so that any accidental splashes, which a beginner can hardly hope to avoid, may be saved from spoiling the carpet or boards beneath it. These precautions should be made because the head of a household is apt to look with anything but favour on an amusement which is found to injure furniture or carpets, whilst if it is seen that every precaution is taken to avoid such disasters, the tyro may not only work with impunity, but also be encouraged.

Well, it may be supposed that all these precautions are taken. The tyro should then arrange his light so that he

can see a plate when in his developing dish. He should procure a slop-pail and place it at his right-hand side on the "paper carpet," and have a dish containing a solution of hyposulphite of soda (the fixing bath) on the left-hand side of the table; for a half-plate probably six ounces of fluid will suffice. On his right should be a dish containing tap-water. Then, too, handily placed on the table, should be a quart jug filled with water, and near the pail a can containing a couple of gallons of water, from which the jug can be re-filled from time to time. The developing solutions should be placed in labelled bottles on the table, together with a minim and


*Fig.* 21.—Glass Measures.

a two-ounce measure, and a cup capable of holding three or four ounces of solution.

Now as to preparing the developer. This can be done in the daylight. The photographer should be in possession of a cheap set of scales and weights; most dealers supply a sufficiently good set for less than a crown. For weighing purposes, circles of white paper, cut out of uniformly thick paper such

as letter-paper, should be cut of the size of the scale-pan, and be used for every weighing operation. To cut these it is useful to have a piece of circular tin of the same size as the discs to be cut. Two or three thicknesses of paper are folded together and placed against the tin, and with a pair of scissors several paper discs may be cut out at the same time. The weights are usually marked in grains, scruples, and drachms. (It should be remembered that twenty grains make a scruple, and sixty grains a drachm.) We propose giving two developers which may be used with advantage, and the tyro can take his choice of them. The first is much quicker in action than the other, and perhaps it would be well for him to take the second one to start with. Three eight-ounce bottles should be scrupulously cleaned out with water. The ordinary medicine-bottle will answer admirably if care be taken that it is clean, and that the cork has been thoroughly rinsed. The first solution we will make up is a pyrogallic acid solution. Pyrogallic acid is very light for the bulk it occupies, and a small quantity by weight will fill the scale-pan. As in 6 oz. of water 72 grains of pyrogallic acid has to be dissolved, it will probably be necessary to weigh this quantity out in two distinct weighings of 36 grains each. The pyrogallic acid should, after weighing, be placed in the two-ounce measure, and water added up to the two-ounce mark, and then poured into one of the bottles. Six grains of citric acid should then be weighed out and dissolved by shaking in the bottle. When thus dissolved, two ounces of a saturated solution of sulphite of soda should be added to the solution of pyrogallic acid which is already in the bottle, and the bulk of the liquid made up to six ounces by the addition of two ounces more of water.

A saturated solution of sulphite of soda is made by shaking up sulphite of soda in warm water in a bottle and allowing it to cool. When cold the liquid will be a saturated solution of sulphite of soda. This can be kept in a stock bottle. A soda-water bottle is a convenient size to hold a stock solution.

This, then, is the pyrogallic acid solution, each drachm of which contains one and a half grains of pyrogallic acid. The next solution to make up is the restraining solution of potassium bromide. One hundred and twenty grains of this salt are weighed out and dissolved in six ounces of water in a second bottle, and is labelled "Bromide solution." The third solution to make up is an ammonia solution. The strongest liquor ammonia should be procured from the chemist, and half an ounce of this measured out by the minim measure and put into a third bottle; four and a half ounces of water are then added to it. This bottle should be labelled, "Ammonia solution." The three necessary mixtures for developing are then ready. The formulæ by which these are made up are usually written as follows:

| | |
|---|---|
| No. 1.—Pyrogallic acid ... ... ... | 72 grains |
| Citric acid ... ... ... | 6 ,, |
| Saturated solution of sulphite of soda ... ... ... ... | 2 ounces |
| Water ... ... ... ... | 4 ,, |
| No. 2.—Bromide of potassium ... ... | 20 grains |
| Water ... ... ... ... | 1 ounce |
| No. 3.—Ammonia ... ... ... | 1 part |
| Water ... ... ... ... | 9 parts |

Now to develop the half-plate, which we will suppose to

have been used, the following proportions are taken, supposing the plate to have been exposed rather more than necessary :—

| | | | | |
|---|---|---|---|---|
| No. 1 | ... | ... | ... | 2 drachms |
| No. 2 | ... | ... | ... | 1 drachm |
| No. 3 | ... | .. | ... | ½ ,, |

These are measured out by means of the minim measure into the two-ounce measure, and the bulk of liquid made up to two ounces by means of water. A dish is thoroughly washed out, and the plate to be developed is taken from the slide, or from the box in which it has been stored, and carefully dusted and placed back down in the dish. The gelatine

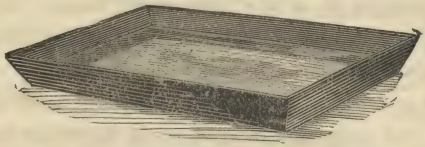

*Fig.* 22.—Developing Dish.

surface which is uppermost is then, by an even sweep of the measure, covered with the developing solution, and the tray rocked to and fro. With some waters it happens that minute air-bells cling to the surface of the plate. In such a case it is well to have a flat soft brush to pass over the surface of the plate to remove them. The young photographer is recommended to use filtered rain or distilled water, which will prevent the formation of these nuisances. If hard water be boiled thoroughly for half an hour, and be used cool, the same purpose is nearly answered.

The advent of the picture is then watched for. Suppose that there is no appearance of an image for thirty seconds, the dish is placed on the table, and half a drachm more of No. 3 (the

ammonia solution) is measured out and poured into the two-ounce measure. The developer from off the plate is poured back into the measure, and again poured over the plate. This should rapidly bring out the picture, and the details in the shadows should gradually appear to gain in strength. A very natural question to ask is, how long the development should continue; and it is rather hard to answer it, as the degree to which the image should penetrate through the film depends largely on the kind of plate which is used. With good commercial plates, in which the film is fairly opaque, the development may be stopped when the most opaque parts appear through at the back of the plate. With plates that are thinly coated the most opaque parts should be black when viewed from the back of the plate.

When a plate is very much over-exposed, and it is known to be so, the above proportions of developer may be slightly modified. Take the following:—

| | | | | |
|---|---|---|---|---|
| No. 1 | ... | ... | ... | ... 2 drachms |
| No. 2 | ... | ... | ... | ... 4 ,, |
| No. 3 | ... | ... | ... | ... 20 minims |

It is probable that an over-exposed plate will show signs of the image in thirty seconds, and if so the development should be continued without the addition of more ammonia, if possible, though if it be seen that for a couple of minutes neither density of deposit nor extra details are shown, twenty minims more may be added, and the development continued as before. Sometimes very much over-exposed pictures have taken us half-an-hour to develop, and excellent negatives have been obtained, though if the full amount of ammonia required for a fairly-exposed plate had been employed at once,

it would have come out in a twentieth of the time, but the negative would have been weak, and the image appear as if a veil were over it.

One thing to be learnt is that density is secured by slow development with a properly restrained developer. For instance, on a dull day a landscape, the lights and shades in nature, will show but small contrast compared with what would be seen on a light day. If developed in the normal manner (see page 51) the contrast of light and shade will be weak and not very satisfactory; but if sufficient exposure be given, and if the first developing solution be made according to the last proportions, the highest lights will come out first and increase in density (*i.e.*, opacity), whilst the shadows come out but slowly, and probably by the time the former are sufficiently opaque, they will be thin and wanting in detail. This can, however, be changed at will. If the developing solution be poured off, and the normal developing solution be made up and applied, the details will strengthen up, and a good negative with plenty of contrast be obtained.

Again, suppose a very highly-lighted landscape be the subject for development, the procedure should be vastly different, otherwise the resulting negative is almost bound to be harsh, and with probably no detail in the high-lights. The method we adopt in developing such a negative is to dilute the normal developer to twice or even three times its ordinary volume, *i.e.*, adding 4 ounces more water to it. This is flowed over the plate in the dish, and the picture allowed to come out, which it should commence to do in about thirty seconds. When the high-lights are *thoroughly* distinct, the developing solution should be poured back into the cup, the plate allowed to drain for half a minute, and

the development be allowed to continue with the solution taken up by the gelatine. The gelatine film is like a sponge, and takes up a certain quantity of fluid, and when the developer is poured off from it, the portions lying in contact with the partially developed high-lights are rapidly exhausted and do no more work; whilst the parts in contact with the shadows of the image are unexhausted and continue or commence the development of the details in those parts. After two or three minutes the plate will probably show an image good in detail but wanting in vigour throughout, and the application of the normal undiluted solution will rapidly bring up density both on the shadows and in the high-lights, with the result that a harmonious negative will be the outcome.

Let it be remembered that the bromide solution is the solution which restrains the image from coming out too rapidly. The more used the slower will be the development, but at the same time a rather more prolonged exposure should be given to the plate if a large proportion of it is to be employed. Pyrogallic acid and ammonia are the real developers, and to develop a definite proportion between the two is necessary. That is to say, if the ammonia be increased without an equivalent quantity of pyrogallic acid being added, the full effect of the developer will be absent. An excess of pyrogallic acid will do no harm, and it is always advisable to have *sufficient* pyrogallic acid for all the ammonia that may be at first, or will be subsequently, added. For this reason the amount of pyrogallic acid solution in the formula has been given. It may here be noted that what is said about the ammonia is equally true about the other alkalies (*e.g.*, sodium carbonate) which may be brought into the developer.

For an instantaneous picture, or one which has had the smallest amount of exposure, a slightly different mode of development is recommended. The plate is placed in the dish and covered with the following :—

| | | |
|---|---|---|
| No. 3.—Ammonia | ... ... ... | 1 drachm |
| Water | ... ... ... ... | 2 ounces |

It is allowed to soak in this for a couple of minutes, and in the meanwhile two drachms of No. 1 and 2 drachms of No. 2 are placed in the measure or cup, and the ammonia solution in the dish poured back into it. The mixture is now poured over the plate, when it will be found that the image will appear very rapidly—so rapidly, in fact, that it must be watched with the greatest attention. Should details not appear in what are the shadows, one drachm more of ammonia must be added, and the development continued.

Should the image, however, rush out, the dish in which the plate is should be emptied into the measure, the plate be washed with water, and the same developer as given for very over-exposed negatives should be used, and the image gradually worked up. It is very useful in such cases of over-exposure, where the ordinary strength of developer has been used, to have a solution of five grains of citric acid to one ounce of water, with which to flood the plate directly the developer has been poured from the dish. This stops all developing action from proceeding, and allows the weaker developer to be applied at one's leisure.

In hot weather with all plates, and in all weathers with some plates, it is well to use, between developing the plate and fixing it, a bath of alum. This is made by putting in water rather more alum than it will dissolve with shaking.

Ten ounces of this solution are diluted with five ounces of water and placed in a dish. The developed plate, after washing, is placed in this solution and left there five minutes, when it is taken out, washed again, and then fixed. The reader may not see the value of this treatment unless explained, so a very brief explanation is here given of its action. Gelatine when placed in water swells by absorbing it, and when on a plate the only direction in which it ought to swell is in the thickness of the film. It sometimes happens that a film swells along the plate, wrinkling up and making the negative useless; and the liability for this annoyance to take place is increased by the developing or fixing solutions. When a moist film is treated with alum it tends to make the film shrink and absorb less water, and the gelatine becomes practically insoluble. In hot weather the gelatine tends to absorb more water than in cold weather, and consequently to dissolve; the alum corrects this tendency, and makes the film tough. This solution may be used over and over again till it is discoloured, without injury to the negative. When very dark, a fresh solution should be taken.

The plate having been developed, and, if necessary, put in the alum bath, the next operation is to fix it—that is, to get rid of the portions of the salts of silver which have not been reduced by the action of the developer. This solution is easily made by making a saturated solution of hyposulphite of soda in water (by shaking up the crystals with water in a bottle), decanting the clear solution, and then adding an equal bulk of water. The formula stands as follows:—

| | |
|---|---|
| Saturated solution of hyposulphite of soda ... | 1 part |
| Water ... ... ... ... ... ... | 1 ,, |

This solution may be used over and over again till it is brown, or till the "fixing" of the plate is very slow, when it must be renewed.

The plate is immersed in it, and kept there till all traces of the yellow silver compound have been removed. In fact, it is better to keep it in a couple of minutes longer. It is then rinsed with water and placed in a dish to wash. This washing must be continued for some time; we should advise for at least three hours, the water being changed in the dish once every half hour. This will get rid of most of the hyposulphite of soda which the gelatine may have absorbed, and the plate must then be stood up in a rack to dry. Some films will

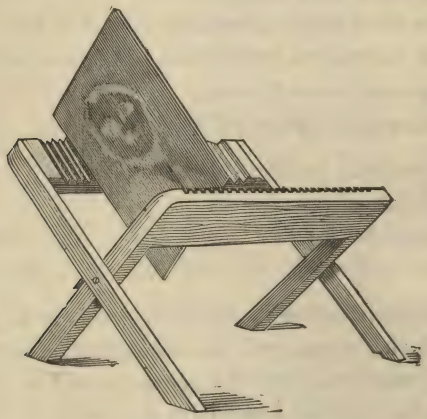

*Fig.* 23.—Plate Rack.

bear washing under the tap; a stream of water applied for ten minutes will generally suffice. The time the drying will take depends on the heat and circulation of the surrounding air and the thickness of the film. On a warm summer's

day the gelatine will probably be dry in a couple of hours, whilst in a cold room in winter it may take twelve hours or more. Thus, then, the negative is produced. When held up to the sky it should appear with full gradation. There should be but little bare glass, *i. e.*, scarcely any part of the film should show no deposit of silver. The densest parts, which represent the brightest parts of the picture (often the sky), should be dense, but not too much so, as if they be, what should be delicate gradations of grey will be white when printed, and the print from it will be chalky and hard. In other words, there should be a total absence of all harshness, to characterise a good negative.

We now come to the alternative method of developing the plates. It is merely a modification of the one already given, but is somewhat easier to work.

The following solutions are to be made up—

| | |
|---|---|
| Warm rain (or distilled) water ... | 4 ounces |
| Sulphite of soda ... ... ... | 2 ,, |
| Bisulphite of soda ... ... ... | ½ ounce |
| Pyrogallic acid ... ... ... | 200 grains |

It is well to dissolve the sulphite of soda in two or three ounces of the water, and the bisulphite of soda in the remainder, and then to put the pyrogallic acid in the bottle containing the sulphite, and finally to pour in the bisulphite solution. The solution should be filtered through filter paper.

Another solution is required before it is complete. Weigh out three ounces of pure carbonate of potash, and dissolve in eight ounces of water. This we will call No. 2, and is written as follows :—

No. 2.—Carbonate of potash ... ... 3 ounces
Water (rain or distilled) ... ... 8 ounces

Those of my readers—and there may be many—who have done no chemical operations should learn how to fold a filter paper for use. Filter paper is to be obtained cut into circular pieces of any size; a six-inch diameter is a generally useful one. For solutions such as the photographer nowadays uses, the white filter paper will answer all purposes, and even white blotting-paper may be pressed into use at a pinch.

The circular filter paper is first folded across A B, and forms

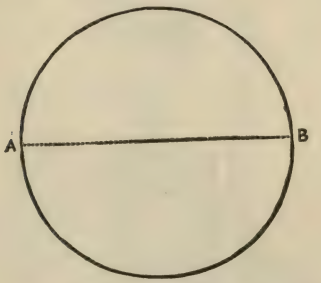


*Fig.* 24.—Filter Paper.

a double semicircle. It is then again folded across C D and

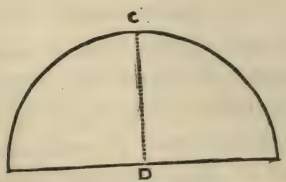


*Fig.* 25.—Filter Paper.

forms a shape as in fig. 26. The paper thus folded up is opened at the top to form a funnel shape, and is inserted in

the funnel as in fig. 27. Before the liquid is poured in, the filter is moistened with water, and when surface dry the

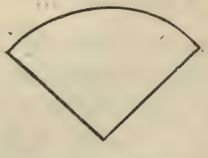

*Fig.* 26.—Filter Paper.

solution is carefully poured in, and the liquid allowed to run into a bottle or beaker.


*Fig.* 27.—Filter.

There is one little artifice which materially helps the rapidity of filtering into a bottle (fig. 27). A small strip of paper, or a match cut to point, should be inserted between the bottle neck and the funnel, to enable the air to escape as the liquid filters in. Fig. 28 shows a useful funnel stand which can often be made available for filtering solutions into beakers, cups, &c.

To develop a fairly-exposed plate, the following proportions are recommended:—For a "half-plate" negative, take one drachm of No. 1, one drachm of No. 2, and make up the amount of fluid to two ounces. Dust the plate as beforementioned (see page 49), and after placing it in a dish, pour

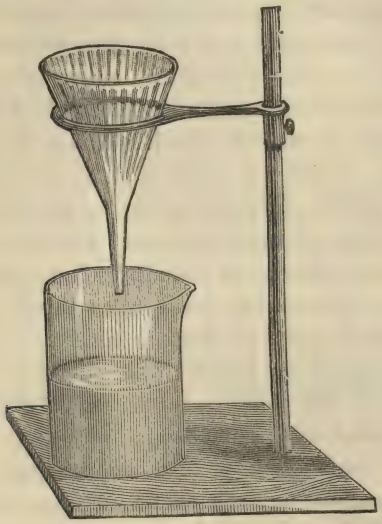

*Fig.* 28.—Filter Stand.

the above over it. If after a minute no image appears, add another half-drachm of No. 2. The image should begin to appear in another half-minute, and if it appears satisfactorily, nothing further should be added, and the density will come up very nicely and gradually. Now suppose a plate is known to be very much over-exposed, to the above quantities it is a capital thing to add about twenty drops of the bromide solution given in the first method of

development (page 48), and to add only half the quantity of No. 2; that is, only half a drachm.

Suppose that it is not known that the plate has received far too much exposure, and that the ordinary developer is used, it will be seen that the image begins to appear rapidly. What course is to be pursued in such a case? Immediately pour back the developer into the developing-cup and wash the plate, and pour over it two ounces of water to which half an ounce of the bromide solution of the first formula has been added, and allow it to soak into the film for a couple of minutes. Whilst this is taking place, add to the developing solution which we have now got in the cup thirty minims or drops of the same bromide solution. Pour the dilute bromide solution from off the plate, and substitute for it the restrained developer, and proceed as usual. One thing to recollect is that bromide prevents the image coming up too rapidly; in fact, it seems as if the bromide destroyed part of the exposure given to the plate, hence there is always a powerful weapon at hand with which to cope with over-exposure.

With an instantaneous picture, whilst using one drachm of No. 1 you may use as much as two drachms and a half of No. 2. This is a powerful developer, but not, to our mind, quite so powerful as the ammonia developer that has already been described.

Of course, in developing, fresh mixtures should be used every time. The plate should be "alumed" and fixed as described (page 54). Remember, however, if alum is used that the plate should be well washed before immersing in this solution, otherwise a muddy deposit may occur, which cannot be got rid of. It may here be stated that should a film appear yellow after fixing, it should be washed and flooded

with a solution of hydrochloric acid (muriatic acid) and water. One drachm of the acid should be mixed with five ounces of water. This will take away any stain, and if the plate be immediately washed, it will suffer no harm. In the case of tender films it is wise, instead of using pure water with the acid, to replace it with a solution of alum made as described p. 54. The reason of the addition of the alum is to prevent the wrinkling (frilling, it is technically called) of the film by the action of the acid. If the negative has been treated with alum previous to the fixing, this addition is almost superfluous.

A very favourite modification of the above developing solution is as follows:—

P.—Dry pyrogallic acid

B.—Bromide of potassium ... ... 20 grains
Water ... ... ... ... 1 ounce

S.—Sulphite soda ... A saturated solution

C.—Pure carbonate of potash ... ... 1 ounce
Water ... ... ... ... 3 ounces

One dr. of C is placed in a developing cup, with two dr. of S, and twenty minims of B, and three grains of P. Enough water is added to make up the solution to two ounces. The developer thus made is not powerful, but a capital ordinary one for general use.

# CHAPTER VII.

## FERROUS-OXALATE DEVELOPER.

There is another charming developer which some few photographers employ, and which should be more employed, as it gives negatives of singular brightness and delicacy. It is called the ferrous oxalate developer, and is very readily made. There is a plan of making it by dissolving what is known as ferrous oxalate in a solution of potassium oxalate, but this has a drawback, in that it is necessary to make up more than is required for immediate use, and it rather quickly loses its developing powers. By using two solutions, one of ferrous sulphate (proto-sulphate of iron), and another of the neutral potassium oxalate, only as much as is absolutely required at the moment need be made. It is made as follows:

No. 1.

| | |
|---|---|
| Ferrous sulphate ... ... | ... 160 grains |
| Water ... ... ... | ... 1 ounce |

No. 2.

| | |
|---|---|
| Potassium oxalate ... ... | ... 1 ounce |
| Water ... ... ... | ... 3 ounces |

One part of the former is mixed with four parts of the latter,

by which a solution of ferrous oxalate in potassium oxalate is formed, although no ferrous oxalate is used. This is accounted for by the fact that the iron in the sulphate combines with part of the oxalate to form the ferrous oxalate, and the remaining potassium oxalate dissolves the ferrous oxalate, which is a powder almost totally insoluble in water. When the chemicals used are quite pure the above mixture is fit to use, but it sometimes happens that the potassium oxalate is slightly alkaline, which is shown by it turning a red litmus test paper blue. In any case it is safer, to each ounce of potassium oxalate, to add two grains of oxalic acid; or into one ounce of the developing solution to drop one drop of sulphuric acid.

In water containing lime, the potassium oxalate solution will always appear slightly turbid, owing to the formation of oxalate of lime; but the photographer need not mind this, as any such turbidity is harmless, when the negative is treated as will be shown subsequently. It should be remarked that the above solutions of ferrous sulphate and potassium oxalate are saturated solutions, *i.e.*, the water holds in solution as much as it can take up, and it may be more easy to prepare the solution by simply shaking up the ferrous sulphate, and also the potassium oxalate, in separate quantities of water, and mixing the solutions in the proportions indicated above. It takes an hour at least to make these saturated solutions, and the bottles in which the solutions are made must be shaken at intervals to prevent only the bottom portion of the solution being saturated. The potassium oxalate may be readily saturated by heating in a flask, or by placing the bottle in cold water and gradually heating it up in a saucepan. It does not do to heat up the iron (ferrous sulphate) in the same

way as the iron oxidizes, and the pure green colour which the ferrous sulphate solution should take becomes a rusty colour. Both solutions should be filtered.

To use this developer, as with the others, judgment must be exercised. It is no exaggeration to say that an exposed plate may be rendered fit for the negative box or for the dust-hole according as it is "judgmatically" developed. Don't let the reader think that he is bound always to succeed. It's probable that the latter receptacle will usually contain more works of art than the former will; at least at first it would, if a capable judge had the verdict to give. But let him rest assured of this, that as well-considered practice is attained, the former receptacle will benefit more, and latter less. When 20 per cent. of the plates only are "wasters through his own fault," the photographer may be very well content.

To return to the absolute manipulations in developing. It is our own practice, except for some special reason, to begin with the above developing solution diluted down to half strength. For a half-plate, 1½ drachms of No. 1 and 6 drachms of No. 2 are measured out and made up with water to 2 ounces.

The plate, after dusting, is placed in the dish, and the above solution swilled over so as to cover the plate without stoppage, and the development is watched. If the image begins to appear in about twenty seconds, the development may be proceeded with till all the detail appears by reflected light in the shadows, when the solution is poured off. It may happen, and probably will do so, that the image is thin and requires strengthening, in which case a new strong solution (that is undiluted with water) is mixed, say, 3 drachms of No. 1 and 12 of No. 2, and to it is added ½ drachm of a

20-grain solution* of bromide of potassium to the ounce of water, and the intensity is given by this means. The development should be carried well on with this developer, as on fixing, the image appears weaker than with the alkaline developer.

Suppose the image appears almost immediately the developer is applied, the latter should at once be washed off, and the plate immersed in water to every ounce of which half a drachm of bromide of potassium solution, made as just stated, has been added. To the diluted developer a drachm of the same solution is added, and then the development proceeded with. In such a case it is unlikely that the strong developer can subsequently be applied with success, and any subsequent additional intensity must be obtained by subsequent intensification (see Chap. X.) When it is known that over-exposure has been given to the plate—and it should be remarked that the same exposure is required with this development as with the alkaline—then the bromide of potassium solution should be added, and the weak ferrous oxalate in the first instance. In a case of over-exposure it is often useful to have at hand some old ferrous oxalate solution, and to add one quarter the bulk of the freshly-made solution as well as the bromide. The reason for this addition is that the old solution in a degree destroys the excess of exposure.

In a case of what may be called abnormally short exposure, to the normal developer we can add a solution which, if a picture is not hopelessly under-exposed, will give a negative

---

* The same as used in the alkaline developer, page 48.

with every detail which might otherwise be absent. The magic addition is the following:—

| | |
|---|---|
| Hyposulphite of soda ... ... | 20 grains |
| Water ... ... ... ... | 1 ounce |

To make this powerful detail-giving developer, to each ounce of the strong, undiluted developer add twenty drops of the above, stir well, and immediately flow it over the plate, and a faint image will rapidly appear and gradually attain proper intensity. This solution of hyposulphite is a most powerful weapon to hold in one's armoury, and should not be resorted to unless other methods fail, or are likely to fail. It tells one tale, however, and that is, wherever this developer is used, the hands should be perfectly free from all traces of hyposulphite, which will, in the ordinary course of events, cling to them when removing a plate from the fixing bath. Stains on the plates may often be traced to the hands being thus contaminated. If the hands be rinsed in dilute hydrochloric acid, made by adding twenty drops of hydrochloric acid to one ounce of water, the hands will be freed from it, This should be noted and acted upon.

If, on development with the diluted developing solution, it is found that the development flags, twenty drops of the above hyposulphite solution to each ounce of the developer may be dropped into the cup, the solution from the dish poured back, and accelerated developer again applied. This should be done before the image attains much density, as if otherwise, the negative may be hard, owing to the brighter parts of the image being too much "brought out" before the shadow details appear. The strong developer, restrained

with the bromide of potassium, is afterwards applied. The method of developing instantaneous pictures need scarcely be mentioned. In such a case, the accelerating hyposulphite solution must of course be employed.

It should be noted that the same developing solutions will develop several plates, but each plate that is developed will weaken it. After three or four plates have been developed, there will be a considerable quantity of ferric oxalate in the solution, as well as of bromide of potassium. Hence the least exposed plate should be developed first, and those most exposed last.

The negative, after development, should be washed and placed in the alum solution (see page 54). This will remove any oxalate of lime which may be formed. After a good washing, it is fixed in the hyposulphite solution, washed, and dried, as given at page 55.

# CHAPTER VIII.

## FRILLING OF THE PLATE, ETC.

In the previous chapter we have given hints as to developing, on the supposition that the plates are mechanically perfect, as well as chemically. It does happen sometimes, however, that accidentally they are not perfect; for instance, sometimes a plate will frill (the reader will know what is meant by frilling, from the previous chapter) during development, in the fixing bath, or during washing. When they frill during development, they are very difficult to treat. Alum, we know, hardens the film, and will usually stop frilling; but then alum, if used with alkaline developer, will stop the developing action altogether, and hence it is inadvisable to add it to the developer. With the ferrous oxalate such is not the case, and a plate may be soaked in alum or chrome alum before developing, and washed, if this developer be employed; or a drachm of a saturated solution of chrome alum—which is a most powerful film hardener—may be added to the two ounces of developer without ill effect on the image, and with the effect of stopping frilling.

Another mechanical preventive is to coat the film with

plain collodion, such as can be obtained of any photographic chemist, and, whilst the film is tacky, to soak the plate in water to get rid of the ether and alcohol (which are the solvents used in collodion), and then either developer may be applied. The film will probably rise in blisters, but no frilling will occur, since the collodion film prevents it so doing. In such a case, it is well to completely detach the film from the plate after fixing, and replace it on a clean glass plate, over which a thin coating of gelatine (ten grains dissolved in one ounce of water by heat) has been poured. The plain gelatine film should be allowed to dry first, be then moistened, and the developed and fixed film be brought on to it when in a dish of water, and all air-bubbles be expelled (see page 77). The films should be brought in close contact by means of a handkerchief or a squeegee, as used in carbon printing, a piece of smooth paper being placed over the film to protect it from any accidental scratches, &c.

When plates frill in the fixing bath, the alum bath must be first brought into use, and that will probably effect a cure; if not, the fixing bath must contain alum. Equal parts of saturated solution of alum in water and of hyposulphite in water must be mixed, and be left to settle. A certain amount of opalescence will ensue, due to sulphur being liberated from the hyposulphite by the alum, and, when filtered, the plates may be fixed in this solution. This should be a cure, not only for frilling during fixing, but for frilling during washing.

A plate which blisters in the washing water may often be saved if the hyposulphite is moderately eliminated by flooding it with methylated spirit two or three times. This abstracts the water from the film and blisters, and it will

rapidly dry. It may then be immersed in the alum bath and be again washed, when the blister should be absent. Our advice, however, is to reject such plates and use better ones.

In hot weather, as already said in Chapter VII., ferrous oxalate may be used with chrome alum without ill effect. The chrome alum hardens the film and renders it insoluble, a great point in hot climates. Supposing plates are slightly veiled or "fogged," as it is called, a good exposure should be given to such a batch, and the development be well restrained by adding double the amount of the bromide of potassium solution given in Chapter VI. This will enable the image to be thoroughly developed without the fog appearing. In many rapid plates there is often a little fog visible if the development takes place with the normal solutions. The fact is that the supposed rapidity is often due to the veil. It is very easy to see if a negative is veiled, as the edges, which are covered in the slides, should be quite bright. We treat of this, however, more fully further on.

# CHAPTER IX.

## DEVELOPMENT OF PAPER.

In the last chapters we have described the development of glass plates. We have now to say a few words on the development of paper. There are two kinds of paper on which negatives are to be taken in the market, one ordinary opaque paper, with a gelatine film on one side, the other transparent paper with a film on both sides. The actual method of development may be the same in both cases. The idea of using paper for negative making is very fascinating on account of its lightness and its freedom from halation,* caused by reflection of the light which is passed through the film, and which, with a glass plate, is reflected back again; and if very prolonged exposure be given it causes a halo of light to encroach on what should be shown as transparent on the negative. When these two advantages are named we have named almost everything that can be said in its favour. The drawbacks to it are the grain of the paper, which shows, and

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* For a full explanation of this phenomenon the reader is referred to "Instruction in Photography," by the writer (Piper and Carter).

the want of flatness which is often found when it is dried. This latter defect is not insuperable, but it is not so easy to get over as it may seem at first sight. Now as to the development of this paper it is an essential that it shall not stain, and for this reason a developer which contains sulphite is to be employed, if it be an alkaline developer (containing carbonate of potash or soda, or ammonia). The following developer is one which the Eastman Company recommended, and which we have found very good. It does not differ much from that given at page 58.

| | | |
|---|---|---|
| No. 1.—Sodium sulphite ... ... | ... | 6 ounces |
| Distilled or boiled water... | ... | 4 ,, |
| Pyrogallic acid ... ... | ... | 1 ounce |
| No. 2.—Sodium carbonate (pure)... | ... | ¼ lb. |
| Water ... ... ... | ... | 1 quart |

A dish rather larger than the paper should be half filled with water, and the paper should be immersed in it so that it is well wetted back and front. (With paper coated on both sides it is important that both sides should be wetted thoroughly before it touches the bottom of the dish, as otherwise it is liable to stick and produce a faulty negative.)

For a half-plate negative the following proportions may be employed—

| | | |
|---|---|---|
| No. 1... ... ... ... | ... | ½ ounce |
| No. 2 .. ... ... ... | ... | ½ ,, |
| Water ... ... ... | ... | ½ ,, |

These should be mixed in a glass or cup, and applied after draining the water from the dish in which the paper is laying. With right exposure the image should appear in about twenty

seconds, and go on increasing gradually in detail and density. Should the image appear too quickly the developer should be poured off into the cup, the paper washed, and 20 drops of the following added to the cup:—

| | |
|---|---|
| Potassium bromide... ... ... | 20 grains |
| Water ... ... ... ... | 1 ounce |

This will keep the shadows bright, and allow the high lights to attain density.

We ourselves prefer to commence developing any negative with half the quantity of No. 2 (the carbonate solution), and thus any signs of over-exposure make themselves known, as, for instance, by the image commencing to come out in ten seconds. The slower development allows more time to stop the action, as just described, and to add the bromide. It is always easy to add more of No. 2, and if development flags with the weak developer this should be done.

For instantaneous work the developer should be made as follows:—

| | |
|---|---|
| No. 1... ... ... ... ... | ½ ounce |
| No. 2... ... ... ... ... | 1 ,, |
| Water ... ... ... ... | 1 ,, |

This is a more powerful developer, and brings out detail. (It should be recollected in every case that when paper is coated on both sides it should be constantly turned over in the dish, so that back and front are alternately visible. This is important to secure perfectly even development.)

The alkaline developers given at pages 58 and 61 may also be employed, and exactly the same directions followed as for glass plates. The ferrous oxalate developer may also be used,

and the directions given in Chapter VII. also be followed, except that before it is attempted to wash the developed image with water it should be washed with a dilute solution of hydrochloric acid and water, or sulphuric acid and water (made by mixing one part of the acid with 100 parts of water). When the paper has been thoroughly soaked in this, the paper should be washed with water till no acid remain in its pores. Two or three minutes' soaking in water, changing it two or three times, will effect this. It is then ready for the next operation.

Whatever developer be used, it is advisable to use the alum bath given at page 54, and to allow the paper to remain in five or six minutes. It must then be washed again thoroughly, and be fixed in a clean fixing bath, as usual. It cannot be too much impressed upon the tyro that the paper should be well washed before placing it in the alum, as if not there will be a deposit which cannot be got rid of.

When the fixing is quite complete, the paper negative must be again well washed and dried. If the paper be simply hung up to dry it will (especially if coated on both sides) cockle and not lie flat in the printing frame. To avoid this it is recommended that it be squeegeed or pressed down by means of a handkerchief, as described at page 77, upon hard rubber over which an oily rag has been rubbed, or upon smooth oilcloth. This paper will dry flat on either of these, and can then be readily removed. It should be remarked that either at this stage or after oiling or washing, the negative can be intensified as directed in the next chapter.

Should the paper be non-transparent, the next operation is

to render it translucent. This may be done in a variety of ways. We ourselves prefer the old waxing process, which is as follows:—"A flat iron should be warmed, and thoroughly cleaned by rubbing on emery cloth and blotting-paper, and a small cake of pure white wax be brought in contact with its point on the back of the negative. The heat melts a certain amount of the wax, which, by moving the iron, can be spread over any desired portion of the picture. Blotting-paper should then be placed over the negative, and the hot iron passed over the surface of the blotting-paper till all superfluous wax is removed. The negative is now fit for printing purposes."

The Eastman Company's old directions for rendering translucent were as follows:—"Lay the negative down on a clean sheet of paper, and give it a coat of castor oil applied with a rag. Then press it with a hot iron until it shows an even dark colour. Use plenty of oil. If the iron is too hot it will dry out the oil, and it will be necessary to go over it with the rag again. If the iron is not hot enough, it will fail to cause the oil to penetrate the paper sufficiently. When an even colour is obtained, wipe off the excess of oil with a soft cloth, and the negative is ready to print.

"Instead of using a hot iron, the negative may be held over the stove or boiled in it until the oil sinks into the paper. This expels the air in the paper and fills the pores, so that on examination it will be found that the grain has disappeared, leaving a fine ground-glass effect. No oil should be allowed to get on the face of the negative; in case it does, it may be removed with a cloth and a few drops of alcohol. Canada balsam and a solvent (such as turpentine or benzine) is also recommended by some, and is effective."

The drawback to this method is that in warm weather the negatives have to be frequently re-oiled. The same firm now recommends using crude vaseline for the purpose, applying it in somewhat the same manner. Mr. H. T. Wood finds that translucency can very well be given by using a solution of Canada balsam in benzoline. No doubt a great drawback to the non-transparent paper is this process of rendering translucent. With paper that is transparent to begin with, of course this operation is not required.

The Eastman Company are now introducing what they term stripping films, which give very excellent results. The film itself is insoluble in hot water, and is supported on paper coated with soluble gelatine. The exposure and development are carried out as for the production of paper negatives, and is, in fact, when first developed, absolutely identical. One thing to be remembered is that the minimum of pyrogallic acid should be used, as it is apt to render the soluble substratum of gelatine insoluble. For our own part we prefer to use ferrous oxalate development, since then all danger of this insolubility is avoided. The Eastman Company gives directions for the films, as soon as fixed and slightly washed, to be laid down on a glass, slightly larger than the negative, as follows:—A glass is coated with a solution of india-rubber in benzole, and allowed to dry, and this again may be coated with plain collodion. We omit the india-rubber, and simply coat the plate with the plain and filtered collodion (twelve grains of pyroxyline dissolved in one ounce of ether and one of alcohol). The collodion is poured into a pool in the centre of the plate, and just made to flow to the top right-hand corner next to the top left-hand corner, and then to the bottom left-

hand corner, and finally to the bottom right-hand corner, whence it is poured off into the bottle.

The plate is rocked till the collodion loses all streaks, and when set is placed in a dish of water and soaked till all repellant action between water and the ether and alcohol is removed. Two or three changes of water should be used in this operation. Next the slightly washed paper negative is placed face downwards in the water, and the plate and it raised together with a film of water between them. A piece of india-rubber sheeting is placed over the back of the negative, which, by means of an india-rubber squeegee, is brought in contact with the glass, all air-bubbles being thus excluded.

The glass and the negative are next placed between blotting-paper and pressed together with a weight and left for ten minutes. They are then removed and placed in water of about 130° F. The paper gradually loosens and floats off, leaving the developed negative on the glass. After a rinse in cold water a sheet of gelatine is placed in cold water and allowed to soften and swell, and, in a similar manner as above, it and the negative are brought in contact one with the other, and set aside to dry. When thoroughly dry the negative can be separated from the plate by cutting round it with a knife, the two films of gelatine and the collodion being detached. The side to be placed next the printing paper is collodionised, and is, therefore, protected from injury by the silver, though the other side of the film may be used if a reversed print is required, as is the case in some processes. It should be remarked that when the negative film is on the glass it may be intensified by any of the intensifiers. We prefer to let the paper negative dry before

making the transfer to glass, and it gets rid of some dangers which may be met with by tyros if it be made when the gelatine is thoroughly soaked. The dry paper negative is soaked in water till the curl is just taken out of it, and transferred when in this state as just described.

# CHAPTER X.

## INTENSIFYING THE NEGATIVE.

The question now comes whether the negative will print well, which at first is a difficult point to settle. With practice it may be fairly judged, but there will be many failures in judgment before a right estimate is formed. One thing to remember is, that when endeavouring to form an estimate of density, a bright, direct light, such as of the sun or candle, should never be resorted to. The image is best examined by allowing a strongish light to fall on a sheet of white paper, and to hold the negative so that the light is reflected through from it. If a piece of printed matter be placed upon the white paper the letters should be unreadable through the most opaque part, such as the sky in a landscape picture, whilst the deepest shadow should scarcely cut off any light whatever. If it answers these conditions, and if there is detail visible in every part of the picture, the negative is likely to be a good "printer." It may happen, and frequently does, that through thinness in the film itself (caused by the makers starving it of sufficient sensitive material), or through-badly timed exposure—over-exposure tends to give a thin image unless the development take place very

slowly—or through an error in judging the opacity during development, the negative is too transparent in the place where it ought to be fairly opaque. In such a case resort must be had to what is called intensification. The developed image, when looked at in the microscope, is found to be composed of minute grains of silver scattered over the film with varying closeness. Where the negative is opaque, these grains are very close together; but where less opaque, the particles may be fairly distant apart. Now if we can by any means make each particle of silver enlarge in dimensions, it is quite evident that if such enlarged particle be black, like silver, the density at every part will be proportionally increased as the distance apart from particle to particle will be diminished. This is the action which really does occur in intensification. A solution of bichloride of mercury (which is known in trade as corrosive sublimate) is applied to the film, and particles of a mercury salt are attached to each particle of silver. When so attaching itself the silver itself is changed into a white salt, and the mercury salt itself is white, so the opacity is white opacity, and is not good for printing purposes. But this white opacity may be changed to black opacity by applying another chemical or chemicals to the plate, which alters its chemical composition, but does not remove the particle from the silver, and hence the required opacity may be obtained.

Either of the following two intensifiers may be used with advantage, the last by preference on some accounts, as it gives negatives which do not change colour by keeping. The reason why we hesitate absolutely to recommend it for adoption by our readers is the poisonous character of at least one of the ingredients. Even the first one is slightly open

to this objection, as bichloride of mercury is a poison if taken internally; and if a cut or sore be on the finger, such a wound should not come in contact with the mercury solution. As mercury is a necessity for intensification, these facts should be attended to. When the negative has been fixed, it must be *thoroughly* washed and dried. Should it be found that it is too weak to give a good print, it is allowed to soak some five minutes in cold water, and is then immersed in a dish containing the following—

| | |
|---|---|
| Bichloride of mercury ... ... | 100 grains |
| Bromide of potassium ... ... | 100 ,, |
| Water ... ... ... ... | 10 ounces |

In mixing this bath it is well to dissolve the bromide of potassium in the water first, and then to add the bichloride of mercury. This last can be crushed to a powder by a pestle and mortar, or it can be crushed on a slab of slate by means of the glass stopper of a bottle. If this course be adopted it will be found that the mercury salt dissolves readily, and should form a clear solution. If it do not, it must be filtered from one bottle into another, and the latter be labelled with the formula just given, as it will enable the photographer to know at a glance what are its contents. The negative, when immersed in this solution, gradually assumes a white colour, due to the formation of the new silver and mercury compound, which forms the image. It is well to rock the dish during this bleaching. When bleached through to the back (which can be judged by raising the plate by a piece of string laid across the dish previous to it being placed in it) it is known to have been sufficiently long in this solution. It is taken out and thoroughly washed

in different changes of water, say half a dozen, for a quarter of an hour. It is then immersed in one of the two following baths:—

| | |
|---|---|
| A saturated solution of sulphite of soda ... ... ... ... | 5 ounces |
| Water... ... ... ... ... | 5 „ |

The saturated solution of sulphite of soda is best prepared by adding to a handful of sulphite of soda boiling water, shaking it up, and allowing it to cool. Of such a solution five ounces are taken and mixed with the five ounces of water. The negative in this bath assumes a brown-black colour, very intense sometimes—in fact, too intense. It must, before anything else is done, be well washed. When this is accomplished, it may be dried, and a print taken from it. Should it give a print with proper gradation, all that remains to do is to varnish it, which operation will be described subsequently. Should it give a print which is too black and white, it must again be soaked in water for five minutes, and the following solution in a labelled bottle be made up:—

| | |
|---|---|
| Hyposulphite of soda ... ... | 200 grains |
| Water ... ... ... ... | 10 ounces |

The negative is placed in this, and examined from time to time. It will be found that the intensity gradually diminishes; in fact, if left in sufficiently long, it would return to its original weak state. (The hyposulphite solution works by decomposing part of the new compound of mercury and silver which has been formed by the two solutions just described.) The negative must be taken out when it is judged to be sufficiently reduced, and again well washed and dried.

We now give the alternative solution to the sulphite of soda. It is made as follows:—

One hundred grains of silver nitrate are dissolved in ten ounces water. One hundred grains of cyanide of potassium (which is a *most deadly poison*, and which should be most carefully handled) are dissolved in one ounce of water. This last is gradually added to the first, and a white precipitate at first forms, which, on the further addition of cyanide, redissolves. Just sufficient of this last should be added that the liquid remains very slightly turbid. It is then filtered and labelled. The negative, after blanching in the mercury, and washing, may be immersed in this bath instead of the sulphite. The colour will change to a deep black, which appears rather more dense when the plate is wet than when it is dry It is washed and dried, and may be reduced by the solutio of hyposulphite as described above.

We have found that paper negatives may be intensified by either of the foregoing intensifiers, without any risk either *before or after* the paper has been rendered translucent. This is a matter of some importance, considering the difficulty that is often experienced in judging of the right intensity of such negatives.

# CHAPTER XI.

## VARNISHING THE NEGATIVE.

It may be thought, according to the last article, that the negative is finished; but there are one or two matters to attend to before it can be considered complete. Let the reader try one little experiment, and he will soon see that there is something more to be done. Let him take a small grain of nitrate of silver and dissolve it in a thimbleful of water, and put one drop on the finished negative and let it dry, and then expose it to light. He will find that a red spot is produced on the negative which is very hard to eliminate; in fact, fairly strong cyanide of potassium solution must be applied to it to take it away. Now we dare say, for the moment, it will not be perceived what *practical* bearing this has, but if it be remembered that a negative has to be printed, and that the paper usually employed has nitrate of silver upon it, and further that in damp weather paper always absorbs a certain amount of water (drawing-paper, for instance, will absorb as much as one-eighth of its weight of water from the air), it will be seen that the nitrate of silver on the paper is quite ready to transfer itself on to the negative and cause the red marks.

The way to avoid this is to use a varnish to protect the image from such an effect.

There are various kinds of varnish sold for the purpose, but if ordinary carriage varnish, to be obtained of any colourman, is procured, and diluted down with methylated spirit to three times it bulk, a very fair varnish for the purpose will be made.

To apply the varnish requires a little skill, and we will go through the process. First of all the plate must be warmed. It may be warmed in the front of a fire to such a heat that the back of the plate is just uncomfortably warm to the back of the hand. The varnish, which should be quite bright and clear, is then applied by pouring a little pool in the centre of the plate, which is to be held horizontally by one corner, the thumb on the top and three fingers below supporting it. Enough varnish is poured on the plate to fill the dotted circle shown in the figure, and then the plate is slightly tilted

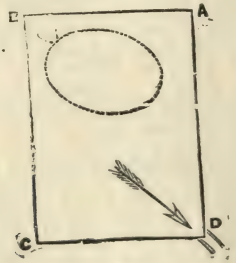


*Fig.* 29.

so that the pool runs to A, then to B, next to C, and finally to D, where the surplus is poured off. The plate is then slightly rocked vertically, and the end C D pressed on to blotting-paper to absorb all surplus varnish that may have

collected. It is next thoroughly warmed before the fire and allowed to cool, and only then the negative is complete for printing.

We have said that a fire is to be used for heating the plate, but there are other sources of heat which answer equally well. A plate may be held six inches above the chimney of an ordinary paraffin lamp, and be moved about so that it gets equally heated all over. Here we have a source of heat which is usually at hand, and one which can be utilised without scorching the fingers and hands, which a fire is apt to do. Of course this plan may be adopted both for the preliminary heating and the final heating.

It is a great point not to heat the plate too much, as in such a case the spirit evaporates too soon, and the surface is apt to be streaky. On the other hand it must be heated sufficiently, or the varnish will dry dead, or "matt," as it is technically called. There is an excellent varnish in the market now, prepared by Mr. Warnerke, which is applied cold to the plate. It is perfectly waterproof and very hard. It is applied to the plate as above, and after all excess is drained off it is left to dry spontaneously, which it does in about an hour. A cold varnish of this description is the only one which can be effectually applied to paper negatives, and this should be done when many prints have to be taken from such a negative. Such varnish may be applied by a flat brush, or by floating the surface of the negative on a solution of it. The back of the paper should be free from it, unless the paper be double coated, in which case the paper may be dragged through the solution.

# CHAPTER XII.

## FAILURES AND REMEDIES.

If there be any captious critics amongst our readers, they may lay hold on what is at first sight a contradiction in our directions for producing negatives. They may say that we directed, before deciding whether a negative was of proper density, a print was to be taken from it before varnish, ing, and that now we say a negative should be varnished before printing. If the paper and the negative be *quite dry*, there is no danger in taking a print from an unvarnished negative, and, before making a trial print, precautions should be taken to secure the dryness of both. To be a successful photographer, besides cleanliness in manipulation, it is held that the beginner should not be a mere machine, but that he should use his reasoning powers. We remember once being struck by some formulæ in a photographic journal, in which, amongst other ingredients, it was invariably stated that "brains *quant. suff.*" was always to be one, and we recommend that the same ingredient be added in the formulæ previously given.

For instance, it must be remembered that in using a developer an increase in the amount of ammonia or carbonate

of potash used is potent in bringing out a plate slightly lacking in exposure; that the bromide used restrains the image from flashing out; and, supposing enough be used, that the amount of pyrogallic acid has *very* little to do with the matter. Now what part does the sulphite of soda play? The principal part it plays is to keep the negative from being stained, and a very useful adjunct it is on the whole. We would say that it is not absolutely necessary to use the sulphite, but it is better to do so.

Now one or two final words upon failures and their cause may be of use. Let us commence by advising that the last things to abuse as a cause of failure are the plates. As a rule, it may be said that the plates bear blame which really should be borne by the photographic tyro. For instance, I know of many cases in which the plates are abused for showing small pin-holes. In the vast majority of cases such pin-holes are attributable to dust in the slide, and when such is the case they are to be found most at the end from which the front board is withdrawn. A little glycerine and water rubbed over the slides as already stated will cure this defect. Then as to "fog" on a plate—namely, when a plate does not look bright. The first thing to do is to examine the edges of the plates, which are covered by the rebates of the slide. Examine all round the edges, and see if any part of them is bright—*i.e.*, without deposit. If any part is bright, the fault is not with the plate. Remember to examine "all round the edges," for it is more than probable that the edges next the opaque portions, such as the sky, may not be bright, owing to halation, as it is called, which is due to reflection from the back of the plate.

If there is a deposit over all the edges still, do not blame

the plate until it is seen that you yourself are not to blame. See if a plate taken out of the packet without exposure remains bright with the developer on it for a couple of minutes. It must be remembered that no plate can be placed in a developer indefinitely without eventually fogging. Even if it does not remain quite bright with such test, still try another test. Place the plate in the dark-slide and pull up half of the front and expose it to the light of the developing-room for a couple of minutes, and develop. If the plate shows no signs of where the exposure was given, but still has a general fog, the plates may finally be blamed.

Thinness of image may be the fault of over-exposure or of the plate. Our advice is only to purchase plates which are not too transparent before being developed. If to get a good picture requires a certain amount of silver on the plate, be quite sure of this, that half the amount won't give satisfactory results. Over-exposure may be corrected by very slow development, as we have already said, and if our readers will only follow the directions we have given, we do not fear that they will suffer from weak negatives from this cause.

Frilling or wrinkling of the film I have already talked about. With a good plate this should never happen. Suppose, however, plates show signs of it, and that the reader has exposed several of the same batch, and wishes to get a picture from them, there is one remedy which rarely fails. Let him purchase some *plain* collodion (*not iodized* collodion), and coat the surface of the plate before development with it by pouring it on as if it were varnish (*the plate must not be warmed*), and when it is set, but not dry, place it in a dish of water and wash off all the ether and alcohol which cling to it. The development of the plate may then

proceed as usual. The collodion acts as a skin to bind the gelatine film together. The film may come off in the fixing-bath, but it can readily be transfered to a glass plate if it do so. If plates do not frill in development, but afterwards, the plate may be allowed to dry before fixing, and be coated with collodion and then fixed. This will save the negative.

Sometimes what is known as green fog is found on plates developed with the alkaline developer. Such an appearance means that the plates have been badly manufactured. As a rule, however, the slight defect that may be met with will not interfere with the printing qualities of the negatives. It may happen that the *surface* of a plate after development shows what may be mistaken for green fog; but this defect can be readily distinguished from true green fog, as it usually appears in patches, with small portions quite free from it. As a rule, this kind of defect indicates that the plates have been kept in a damp place, and probably in contact with paper. We have found that sometimes plates may be cured by thoroughly drying. If a good long exposure be given, and the plates are developed slowly, the evil is mitigated, though not cured.

If a plate be developed so that the image is too intense, giving chalky prints, the density may be reduced by means of the following solution, amongst others:—

| | | |
|---|---|---|
| Dry chloride of lime | ... ... | 2 ounces |
| Carbonate of potash | ... ... | 4 ,, |
| Water ... ... ... | ... | 40 ,, |

(This is sold by chemists under the name of "Eau de Javelle.")

The method of making this solution is to dissolve the chloride of lime in 30 ounces of the water, and the carbonate

of potash in the other 10 ounces of the water. The two solutions are then mixed, boiled, and *filtered*. Carbonate of soda may be substituted for the carbonate of potash if more convenient. To reduce the image, 1 ounce of the above is mixed with 5 ounces of water, and the plate immersed in it. The image will be slightly bleached after a short time, and should then be washed and placed in the toning bath, and again washed. If the density is not reduced sufficiently, the same operation must be repeated till the density is satisfactory.

We have already stated that plates developed with soda developer may show a yellow stain, and we have given a means of eliminating it. For convenience we repeat here the formula, which is effective:—

| | |
|---|---|
| Alum (a saturated solution) | ... 20 ounces |
| Hydrochloric acid ... ... | ... ½ ounce |

The plate is immersed in this after fixing and washing, and the colour will disappear unless it be very badly stained.

Opaque spots on a plate are almost invariably due to dust settling on a plate when drying.

Semi-transparent spots in a plate are due to faults in the glass, or to faulty gelatine. Sometimes circular rings of less dense deposit appear in the negative. This is generally due to the use of too much alcohol in the emulsion when coating the plates. This cannot be remedied by the photographer who purchases his plates.

Dark lines may appear on negatives. These are often due to the surface of the plates being rubbed by some means or another. Care should be taken to avoid scratching the film in any way.

# CHAPTER XIII.

## GENERAL HINTS.

The plates of which this work treats are what are known as gelatine plates; that is, they are glass plates which are covered with a layer of gelatine in which certain salts of silver are imbedded. These salts consist of particles which are so fine and so close together that being of a buff colour, the gelatine film has the appearance of a continuous buff layer spread over the plate. When examined in a white light it will be seen that the film thus prepared is translucent and not quite opaque, which is what would be expected from the nature of the layer. If the layer is transparent it may at once be set down that the plates are deficient in the silver compound. When a gelatine plate is exposed in the camera to the image formed by the lens, a certain chemical alteration in the sensitive compound takes place in parts, the amount of change depending on the brightness of the image, and the length of time which the surface is exposed. Unless the exposure is very prolonged, indeed, there will be no visible image on the plate after such exposure, but the change will, nevertheless, have taken place. To bring

out or make visible the image, the aid of certain chemical agents ("developers") are brought into requisition, and they are so chosen that when judiciously applied they attack the parts which have been exposed to light, and reduce the silver compound to metallic silver, the quantity reduced being dependent on the length of exposure and brightness of image. By this means the various lights and shades in a picture are reproduced. Beside light and shade, however, the developed image represents the colour of the object, not in the colour itself, but in metallic silver. White light is made up of three primary colours—red, green, and violet—and roughly, it may be said that the green and violet are the visible colours which affect the silver compounds which are on the gelatine plate. Thus, if you have a blue ball or a red ball side by side, though to the eye they appear equally bright, and though the shades may be the same in both, yet in photographing them they will appear very different. With some plates it would be very difficult to get an image of the red ball at all, if the red were a pure colour; but luckily for photography, all objects which appear coloured, not only reflected red light, but also a small proportion of white light, and in the case of the red ball it is the small quantity of white light (which, of course, contains red, green, and blue light) which enables an image of the ball to be obtained at all. This is what we mean by saying that the colour in a picture is reproduced together with the lights and shades. It will thus be seen that a photographic print of a landscape, or coloured picture, say, will not give the same relative luminosities or brightness of the different parts as seen in Nature, but that they will differ according to the colour. Recently attempts have been made to produce a correct rendering of

these luminosities, which are, to a certain extent, successful; but a consideration of them would be beyond the scope of this work.

Now as to the mechanical qualities of the plates we must say a word. Gelatine, when placed in water, swells and absorbs the water, and when swollen it is much more tender than when dry. In this state, too, it is in a state of tension on the glass plate, and endeavours to expand along the plate as well as up from it; a rough touch of the finger on the plate will often cause the film to rise at the part touched, forming a blister, and the surface will wrinkle, and these wrinkles tend to spread, giving rise to "frilling" (see page 68). Again, gelatine is soluble in warm water, and with some films the summer temperature in England is sufficient so to soften the film that it wrinkles and leaves the plate, and even dissolves. This should be recollected by those who travel in hot climates. A film should stand 110° at least before it melts, to be of any service in a climate such as India. The film side of the dry plate should not be touched by the fingers when dry, since any greasy matter, which is always present when the hands are moist, clings to it, and the resulting negative will probably show a mark. Too great care, indeed, cannot be taken in handling plates. They may not suffer nine times out of ten by carelessness in this respect, but the tenth time an otherwise good plate may be spoilt.

We recommend our readers to have their plates in grooved boxes, if possible, or, at all events, when opening a packet of plates to transfer them to such a box. It is very convenient to do so, more especially with most plates, which are separated from each other by small strips of paper. For tours, we strongly recommend that the camera, developing

materials, and dishes should be packed in a strong wicker-work hamper. The easily breakable objects and plates should be first packed in very light wooden boxes, and then consigned to the basket. We have never broken a plate or bottle when this plan was adopted, though the whole of our apparatus has been precipitated from off a mule's back on to the ground. The wicker work acts as a spring, and prevents a sudden jar.

# APPENDIX.

The following are the recommendations of the Photographic Society of Great Britain regarding the apertures of stops for lenses.

1st. That the aperture of the standard-unit diaphragm should have a diameter equal to one-fourth the equivalent focus of the lens, and be marked "1," the approximate equivalent focal length of the lens itself being engraved on the mount;

2nd. That diaphragms with smaller openings should have apertures diminishing in area to the extent of one-half from the unit standard downwards, and be marked successively

2—4—8—16—32—64, &c.

These numbers would indicate to the practical photographer that if a given sensitive film requires with the unit stop an exposure of one second, the introduction of a smaller one would necessitate an exposure of as many seconds as the numbers marked on it; in other words, each stop would require double the exposure of the preceding one.

Should a lens not admit of a diaphragm with an aperture as large in diameter as one-fourth its focal length, nor exactly any one of the above-mentioned sizes, we still recommend that all the apertures be made in uniformity with the above scale, with the exception of the largest, which should be marked with the number its area requires in relation to the unit diaphragm. In the case of a lens having a working aperture exceeding in diameter one-fourth its focal length, the diaphragms should be marked in fractions (as ·5, ·25, &c.), in uniformity with the standard apertures, according to the sizes of their relative apertures. We further advise that diaphragms required to be made with apertures intermediate to the standard sizes should invariably be marked with numbers corresponding to the ratio of their area to the aperture of the unit diaphragm.

The following table, compiled by Mr. Cadett, gives the comparative sensitiveness of plates which show different numbers.

| | Number of times more sensitive than | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 25 | 24 | 23 | 22 | 21 | 20 | 19 | 18 | 17 | 16 | 15 |
| 25 | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{2}{3}$ | 3 | 4 | 5 | 7 | 9 | 12 | 16 |
| 24 | | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{1}{3}$ | 3 | 4 | 5 | 7 | 9 | 12 |
| 23 | | | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{2}{3}$ | 3 | 4 | 5 | 7 | 9 |
| 22 | | | | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{1}{3}$ | 3 | 4 | 5 | 7 |
| 21 | | | | | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{1}{3}$ | 3 | 4 | 5 |
| 20 | | | | | | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{1}{3}$ | 3 | 4 |
| 19 | | | | | | | 1 | $2\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{2}{3}$ | 3 |
| 18 | | | | | | | | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ | $2\frac{1}{3}$ |
| 17 | | | | | | | | | 1 | $1\frac{1}{3}$ | $1\frac{3}{4}$ |
| 16 | | | | | | | | | | 1 | $1\frac{1}{3}$ |
| 15 | | | | | | | | | | | 1 |

The numbers down to 15 only are given, this being more than sufficient for comparison of most plates. Supposing it is desired to compare the rapidity of two plates showing different numbers, look for the higher number in the column

on the left side of the table, and the lower one in the top horizontal row of numbers, then run the eye along the line of the number in the left-hand column until you come to the figure under the lower number; the figure will then show the number of times more sensitive is the plate showing the higher number than the plate showing the lower number. For instance, a plate showing 21 is four times more sensitive than one showing 16; one showing 20 is three times more sensitive than one showing 16, on so on.

## WEIGHTS AND MEASURES.

| | | |
|---|---|---|
| 1 Sovereign weighs | ... ... | ... 123·274 grains |
| 1 Shilling | ,, ... ... ... | ... 87·273 ,, |
| 48 Pence | ,, ... ... ... | ... 1 lb. avoirdupois |
| Half-penny and three-penny piece weigh | | $\frac{1}{4}$ ounce |
| Florin and Sixpence | ... ... | ... $\frac{1}{2}$ ,, |
| Three pennies | ... ... ... | ... 1 ,, |
| 4 half-crowns and 1 shilling | | ... 2 ounces |
| 4 Florins, 4 half-crowns, 2 pennies | | ... 4 ,, |
| 1 Half-penny = 1 inch in diameter | | |

### Avoirdupois Weight.

| | | |
|---|---|---|
| 27$\frac{11}{32}$ Grains ... | ... ... | ... 1 drachm (= 27$\frac{11}{32}$ grs.) |
| 16 Drachms | ... ... | ... 1 ounce (= 437$\frac{1}{2}$ ,, ) |
| 16 Ounces... | ... ... | ... 1 pound (= 7000 ,, ) |

### Troy Weight.

| | | |
|---|---|---|
| 24 grains ... | ... .. | 1 pennyweight (= 24 grains) |
| 20 pennyweights | ... | 1 ounce (= 480 ,, |
| 12 ounces... | ... ... | 1 pound (= 5760 ,, |

### Old Apothecaries' Weight (superseded in 1864).

| | | |
|---|---|---|
| 20 Grains | ... ... ... | 1 scruple (= 20 grains) |
| 3 Scruples | ... ... ... | 1 drachm (= 60 ,, ) |
| 8 Drachms | ... ... ... | 1 ounce (= 480 ,, ) |
| 12 Ounces | ... ... ... | 1 pound (= 5760 ,, ) |

The New Apothecaries' Weight is the same as Avoirdupois.

### Liquid Measure.

| | | |
|---|---|---|
| 60 Minims | ... ... ... | 1 drachm |
| 8 Drachms | ... ... ... | 1 ounce=1·73 cub. ins. nearly |
| 20 Ounces | ... ... ... | 1 pint =34·66 ,, ,, |
| 8 Pints | ... ... ... | 1 gallon=277·25 ,, ,, |

The Imp. Gallon is exactly 10 lbs. Avoir. of pure water; the pint, 1$\frac{1}{4}$ lbs.

### Fluid Measure.

| | | | |
|---|---|---|---|
| 1 Minim | = 1 drop | 2 Drs. | = 1 dessert spoonful |
| 1 Drachm | = 1 teaspoonful | 4 ,, | = 1 table ,, |

### French Measures.

| | |
|---|---|
| 1 Gramme ... | 15·432 grains |
| Kilogramme ... | 1000 grammes (=2·2 lbs. Avoir. nearly) |
| 1 Litre ... ... ... | 35·216 ounces (fluid) |
| 1 Cubic Centimetre (c.c.) ... | 17 minims nearly |
| 50 Cubic Centimetres | 1 ounce 6 drachms 5 minims |
| 1 Metre ... ... ... | 39·37 inches |

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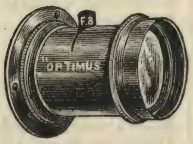


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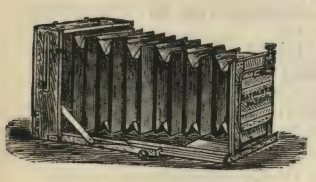

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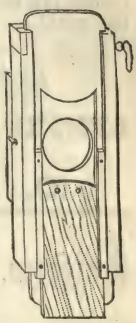

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| 4¼ × 3¼ | 1/0 | 1/6 | 2/0 | 2/6 | 1/6 |
| 6½ × 4¾ | 2/3 | 3/6 | 4/6 | 5/6 | 3/6 |
| 7½ × 5 | 3/5 | 5/0 | 6/0 | 7/0 | 5/0 |
| 8½ × 6½ | 4/3 | 6/0 | 8/0 | 10/0 | 6/0 |
| 10 × 8 | 7/3 | 10/6 | 12/6 | 16/0 | 10/6 |
| 12 × 10 | 10/6 | 15/0 | 18/0 | 24/0 | 15/0 |
| 15 × 12 | 18/0 | 26/6 | 30/0 | | 3¼ × 3¼, 1/0 |

For fine printing quality and freedom from all defects, these Plates are excelled by none, and the ever-increasing demand proves that they have only to be tried to be used exclusively. Specially suited for Export.

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|---|---|---|---|---|---|---|---|
| 1/3 | ... | 4¼ × 3¼ | ... 1/6 | 5/6 | ... | 8½ × 6½ | ... 6/6 |
| 2/- | ... | 5 × 4 | ... 2/4 | 6/6 | ... | 9 × 7 | ... 7/6 |
| 3/- | ... | 6½ × 4¾ | ... 3/6 | 8/9 | ... | 10 × 8 | ... 10/- |
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TERMS—NET CASH WITH ORDER.

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From a Special Formula given to the Company by Captain Abney, R.E., is remarkable for its extreme Rapidity, as well as the great latitude of exposure permissible.

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PRICES—3¼ by 3¼, 1/6 per dozen. Other sizes at Abney Plate prices.

Also, ORTHOCHROMATIC PLATES at Abney Plate prices.

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Will receive prompt attention.

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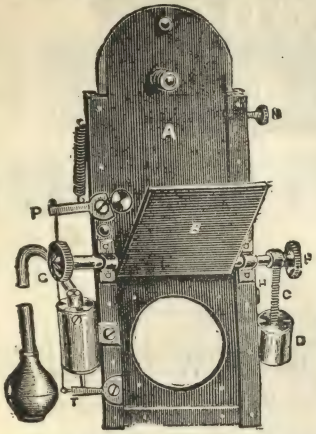


*Fig.* 1.

Adjustable for Instantaneous Medium, or Slow Exposures, by pneumatic means. Price, ½-plate, 21/-

Price 5/- with one Diaphragm. Extra Diaphragms, 1/- each.

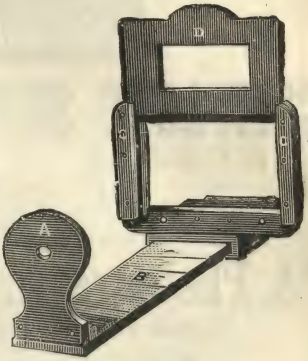


*Fig.* 2.

The **PNEUMATIC PHŒNIX SHUTTER** (*Fig.* 1) is simple and effective. Pressure of India-Rubber Ball allows weighted arm to open B, and at the same time retains A from falling; when pressure is removed, A instantly falls and covers Lens; catch is removable at T for instantaneous exposures.

The **PHŒNIX SHUTTER** as above, but without pneumatic action. Price from 15/-.

**R. & B.'s VIEW METER.**—Weighs less than one ounce, folds compactly to 4 inches in length. Gives angles of view for lenses 3 to 24 in. focus. The novel features of this View Meter consist in the adaptation of diaphragms, which confer two important advantages: 1st. A Diaphragm proportionate to any size of plate may be used; 2nd. The insertion of a suitable Diaphragm multiplies by two the figures on bar B, thus reducing its length for Long Focus Lenses to one half.

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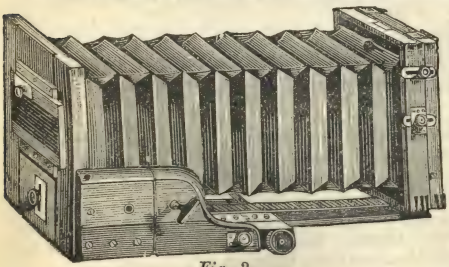

*Fig.* 3.

**R. & B.'s Patent Long-Focus CAMERAS** (*Fig.* 3).

PRICE—½-plate size, with 3 Double Dark Slides, £6 9 6.
1/1-plate size, with 3 Double Dark Slides, £9 2 0.

**R. & B.'s POPULAR CAMERA.**

PRICE, with 3 Double Dark Slides, ½-plate size, £4 15 0; 1/1-plate size, £6 10 0; 12 by 10

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